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PURCHASE TAX ON APPLIANCES

ON Tuesday of last week the Chancellor of the Exchequer, following a debate in the House, agreed that cookers and cooking apparatus should be exempted altogether from the purchase tax of 66⅔%, adding that a case had been made in regard to wash-boilers, which he was inclined to exempt and there were, he said, one or two other cases in which he would like more time to think. We hope that, on reflection, he will decide to exempt gas water heaters in general, for these appliances are, when used with discretion, fuel savers in a very true sense and are certainly equipment essential to health and the proper running of a home.

In connexion with the remission of the tax, so far, unfortunately partial and selective, it is only fitting to record in brief the case submitted to the Chancellor of the Exchequer by the British Gas Council for exemption of gas cooking appliances and the arguments put forward, which we wholeheartedly endorse. The arguments advanced—and, as we have said, they apply with equal force to gas water heaters with sound reasoning—were that the tax was contrary to the public interest; was prejudicial to the housing programme, which includes the erection of new houses, the conversion of existing houses and the repair of houses damaged by enemy action; and would have increased coal consumption and thus would have proved inconsistent with the Government's coal conservation policy and the fuel economy and efficiency activities of the Ministry of Fuel and Power. The use of a gas cooking appliance, or a gas water heater, results in a substantial saving of coal. Nine out of ten people cook by gas, which, as with the water heater, is used only as and when it is needed. The peak demands for cooking can be economically met by gas owing, *inter alia*, to storage facilities; in the interest of coal conservation the use of gas cooking appliances should be encouraged. A householder requires only one cooking appliance and there could be, then, no excessive purchasing to discourage.

The B.G.C. pointed out that every new, converted, and re-conditioned dwelling must have a cooking appliance, over 350,000 of which, it was stated, would be required this year to meet housing requirements, in addition to wash-boilers and water heaters, which are also essential equipment. The appliance is purchased by the local authority or acquired by the tenant for cash or on hire-purchase or hire. If purchased by the local authority, the addition of the purchase tax would have resulted in increased house rentals and/or extra charges on the rates generally. Where the tenant is left to make his own arrangements, the cash or hire-purchase price would often have proved prohibitive, while gas undertakings would have found it difficult to finance the hiring of appliances, since the considerably increased hire charges necessary on taxed appliances could not be maintained on purchase tax being reduced or discontinued. Purchase tax of 66⅔%, together with the rise in the production cost of gas appliances, would have increased their price over the pre-war figure by not less than 200% and in some cases—for example the low-priced cooker—by nearly 300%. This increase would have been unduly burdensome and entirely unjustifiable for appliances essential to daily life and would have fallen chiefly upon those least able to afford it. Many householders would have had to do without essential apparatus, or would have resorted to tax-free solid fuel appliances, or would have continued to use wasteful appliances. Further, housing schemes might have been re-arranged so as to avoid the installation of appliances carrying purchase tax. In any case priority demands will leave few gas cooking appliances available for the general public. Such appliances have been, are, and will continue to be in such short supply to the general public, that the imposition of purchase tax could only have excluded from their acquisition or hire the less well-to-do members of the community. Purchase tax could not have done other than discourage the distribution of the limited supplies available. Again, the production, installation, and cost of gas appliances in the enormous numbers required present formidable problems, the solution of which would have been prejudiced by the unstable conditions created by the re-imposition of a heavy tax eighteen months after its removal. Fall in the production of gas appliances brought about by purchase tax would obviously result in increased prices. The gas appliance production drive, which is being made with the active co-operation of the Government Departments concerned, would be largely negatived. Why, we may add, should water heating appliances be penalized? We repeat our hope that, on reflection—and without delay—Mr. Dalton will agree with our plea to exempt, on grounds of public interest, gas appliances generally from the disproportionate and stultifying purchase tax.

ELECTRICITY IN GAS-WORKS

IN an outstanding and important Paper given to the Institution of Gas Engineers by Mr. G. M. Rimmer, the Gas Industry was accused of being rather tardy in applying electricity to its works. The Author supplied the answer himself. The gas engineer has been waiting to be convinced that electric power can be as reliable as steam. As a matter of fact, there has been no tardiness except in the case of that most essential piece of gas-works equipment, the exhauster, The heart of the gas-works must be kept beating at all costs. Apart from this, the record, from the electrical point of view, has been pretty good. Fifty years ago stoking machines were electrically driven, and with the advent of the vertical retort electrically driven coal and coke handling machinery became the rule with very few exceptions. But even so it remained necessary to guard against interruptions of supply, and in most cases gas-works preferred to generate their own current rather than to rely upon the somewhat unreliable supply from the neighbouring electric power station. In those early days, too, electric constructional engineers were tardy in recognizing that the gas-works motor and switchgear must work with long periods of full load without interruption, for 24 hours a day and for 365 days a year, and that in an atmosphere often impregnated with dust and often exposed to the weather. Motors were imperfectly enclosed and switchgear was never sufficiently robust. It was no doubt natural that designers hesitated to commit themselves to the satisfaction of the stringent requirements of the gas-works until they were sure of their market. And no doubt this tardiness was increased by the fact, as Mr. Rimmer put it, that " private generation has, unfortunately, been discouraged by most electric supply authorities in the interests of load building and regardless of whether or not it was economical or desirable." Nevertheless, the gas engineer persisted and the " gas-works motor " is now a recognized standard, switchgear adequately enclosed and sufficiently robust in construction can be obtained, together with cables suitably insulated and covered to stand up to works requirements. Private (generally steam) generation has remained the rule with some cases of standby supply from the outside, though there are some, not very satisfactory, cases of standby in the form of gas engine driven generators, the defect of which is the difficulty, almost amounting to impossibility, of parallel running with steam-driven sets. The pass-out engine or turbine has also been widely used.

There is plenty of surplus heat and low grade fuel available for the generation of power to meet all the requirements of the works together with pass-out steam for process purposes. Most modern retort houses, for instance, together with their ancillary machinery, are self-supporting in this respect even with retort bench fuel consumption down to 10%. And steam for the rest of the works can be raised in chain grate boilers burning breeze. The much lower transmission losses with electricity as compared with steam are in themselves a sufficient reason for the adoption of electricity for driving exhausters, pumps, and all other machinery in the works. There remains, however, the difficulty that, whereas steam production is more or less constant over the 24 hours, power requirements fluctuate. The complete solution of this problem worked out in Birmingham is an outstanding advance in gas-works practice. It was probably only possible where supported by a progressive and public-spirited municipality owning both the gas and the electricity undertakings. Two sources of electrical energy, that generated on the works and that supplied from the electricity undertaking, operated in parallel afford a real duplication, when so designed that automatic change-over from one to the other can be effected without any interruption. Costs are brought very low by arranging a system of import and export of current. When surplus steam is available surplus current is fed into the public supply and a deficiency is made good by drawing from the public supply, " both processes being entirely automatic."

Advances in design are such that electrical transmission and driving can be applied with safety to every piece of moving machinery on the works. Mr. Rimmer has presented a complete picture of all the points involved, and his Paper is likely to be a standard of reference on this subject for some time to come. But it is evident that the system is as yet applicable only to undertakings of a fair size, and the job of conversion and subsequent maintenance would seem to call for the services of electrical engineers. " Nothing short of the best electrical engineering practice, coupled with continuous vigilance by skilled personnel, will produce absolute safety."

Discussion of this Paper in detail will probably go on for some considerable time, with the more publicity the better, for which purpose the correspondence columns of the " JOURNAL " would prove a happy medium. There are just two points to which attention may be called here. While protection of the motor against overload was fully dealt with, we are not so sure about protection of the plant. Motors driving such machinery as coal-breakers and conveyors must be liberally rated. Experience suggests that, in spite of what is done electrically to stop the motor when overloaded, the plant itself, when stalled by an obstruction, still seems to require some mechanical protection such as a slipping clutch or a shear pin. And finally, while a conclusive case was made for steam generation in waste-heat and other boilers at much higher pressures, 350 lb./sq. in., than hitherto practised, consideration might also be given to W. Gregson's interesting proposition to use hot gas turbines direct on the waste heat flue, a reference to which will be found in our issue of Feb. 6, 1946, p. 227. We start publication of Mr. Rimmer's Paper in the " JOURNAL " to-day.

" INFRA-RED "

THURSDAY of last week saw the opening by the Joint Parliamentary Secretary of the Ministry of Supply of an Exhibition at Gas Industry House of " infra-red " heating by gas. Organization of this exhibition was in every detail highly efficient and the layout of the exhibits, which are too numerous to mention, attracted journalists of national newspapers and technical and trade papers, who, we are certain, were interested in the exhibits on view. Perhaps the magic of " infra-red " drew the crowd, but far and away beyond " infra-red," those who visited the exhibition and those who continue to visit the " infra-red " show at Gas Industry House will become aware that " infra-red " is a very small sample of the total goods which the Gas Industry has to offer. There is no doubt that " infra-red " helps in the production of bedstead frames, ploughs, bricks, and many other items required by the public. We hope that the exhibition, which will be open to view for some time, will serve the purpose of making all sections of the public alive to the fact that through one aspect—" infra-red " —the Gas Industry serves the community in many other directions.

Public Lighting Again

The black-out conditions, in many districts as complete as those during the war years, except in certain main streets and at special danger points, which were imposed at the time of the fuel crisis are to be alleviated during the coming winter. In a written reply to a question last week asking if he was aware of the desire of local authorities to know if a modification of the ban on street lighting was contemplated and if he would make a statement for their guidance, Mr. Barnes, Minister of Transport, said he was preparing a circular on the subject to lighting authorities, based generally on an overall saving of not less than 50% of pre-war consumption.

Personal

Mr. JOHN DUFFY, first Technical Assistant at Dundee Gas Department, has been appointed Assistant Engineer and Manager. He has been in the service of the Department since 1918, and is a member of the local Fuel Advisory Committee.

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Mr. LESLIE HARDERN, Public Relations Officer to the Gas Light and Coke Company, is leaving for Sweden and Denmark this month with a party of planners, housing experts, and architects, under the auspices of the Town and Country Planning Association. The party will be shown all the developments that have taken place during the war years, under the guidance of the foremost Swedish architects and planners.

Diary

June 26.—Yorkshire Junior Gas Association: Visit to works of Derbyshire Silica Firebrick Co., Ltd., Friden, 12 noon.

June 26.—Southern Association of Gas Engineers and Managers: Summer Meeting: Visit to works of North Middlesex Gas Company; Luncheon; Afternoon Visits to Works.

June 27.—Waverley Association of Gas Managers: Annual Meeting, Y.M.C.A. Hall, South St. Andrew Street, Edinburgh, 10.30 a.m.

June 30.—Annual Meetings of British Commercial Gas Association, 2.30 p.m.; National Gas Council, 2.45 p.m.; British Gas Council (Incorporated), 3 p.m.; Federation of Gas Employers, 4 p.m. Gas Industry House.

July 3.—Solid Smokeless Fuels Federation: Executive Committee, Dorchester Hotel, Park Lane, W.1, 11.30 a.m.

National Benzole Association

At the annual meeting of the National Benzole Association on June 11, Sir Richard Pease was re-elected President, with Mr. S. A. Sadler (Chairman of Sadler & Co.) and Mr. A. E. Sylvester (Director of the Gas Light and Coke Company) as Vice-Presidents.

The following representatives were appointed to the Executive Committee, together with Mr. J. H. Olliver, Chairman of the National Benzole Company, Ltd., and Mr. A. Hittinger, Deputy Chairman and Managing Director of the same Company:

Scotland: J. M. Mitchell. N. England: R. D. McCowan. N.E. England: R. Alsop, C.B.E., E. Crowther, Sir Richard Pease, Bart., B. Sadler, S. A. Sadler, and L. Shuttleworth. Yorks, Staffs and Derby: H. H. Berresford, S. Billbrough, E. L. Ford, G. A. Hebden, C. A. Murray, M. H. Rollason, and H. E. G. West. N.W. England and N. Wales: Col. W. M. Carr, O.B.E., J. H. Hughes, and C. Lord. W. England and S. Wales: H. H. Bates, and H. H. Merrett. Midlands: A. W. Lee, and S. Robinson. S. England: Dr. T. H. Butler, R. C. Todhunter, and A. G. Saunders. Representing the Gas Industry: R. J. Auckland, C. S. Shapley, Col. H. C. Smith, C.B.E., A. E. Sylvester, and W. M. Valon.

Coke Oven Contract

Simon-Carves, Ltd., have recently contracted to build for Guest, Keen, and Baldwin, Ltd., a coke oven and by-product plant that will cost more than £1,000,000, at Margam, South Wales. Fifty-four Simon-Carves coke ovens form the existing coking plant at the Margam works, and when the present contract is completed the capacity of this plant will be raised to 2,000 tons of coal per day by the addition of 60 new super underjet compound ovens built in four batteries of 15. The contract includes coke handling plant, primary and secondary coke screening plant, a 2,000 ton self-emptying coal bunker and a unique system of conveyor loading for the charging lorry, also a complete by-product recovery plant.

This is perhaps the largest coke oven contract ever undertaken in this country, and forms an important part of a reconstruction programme that will make Margam one of the greatest iron and steel centres in the industry.

Gas from the original 54 ovens, from the 60 ovens now being built, and from a further 45 ovens that will be added later, will all be handled by the new by-product plant, which will be equipped to produce sulphate of ammonia, crude and rectified benzole, and crude tar. Surplus coke oven gas will go to the steel works and to the local gas undertaking.

Another contract connected with the large scale reconstruction programme at Margam has been obtained by Simon-Carves' boiler department. It is for the construction of four water tube boilers to work at 600 lb. per sq.in., each boiler generating 87,000 lb. of steam per hour. The boilers will be able to use three alternative fuels: oil, blast furnace gas, or coke oven gas. These two contracts together will cost over £1,500,000.

Women Journalists at Beckton

The first party of women journalists to visit the Beckton works of the Gas Light and Coke Company did so on June 11. The trip was made by boat because the river approach is not normally used and its novelty appeals—at least in good weather. The visitors were taken over the gas-works first and then guided through parts of the Company's product works at Beckton, where they were shown some intermediate and finished products.

They were provided with copies of a specially written leaflet—which will be used for subsequent parties, of which there may be a few more before the end of the summer—which stated the case for gas in terms calculated to provide them with "lines" for arresting domestic and feminine "stories." For example, in describing the operations in the product works it enumerated dyes and drugs, vitamins, plastics and scents prominently among the substances produced and added: "From crude spirit again there is a long list, but the most notable to the feminine eye is nylon; perhaps the male eye is attracted also by nylons." It stressed the smoke abatement angle and reminded the visitors that in some North American towns the lighting of an open coal fire is a legal offence and people who break the law are liable to prosecution.

Pointing out that owing to war damage and delayed repairs and maintenance the works will not be in full production for some time, the leaflet explained that Beckton supplies about 40% of London's gas, "so you can imagine how hard pushed we are in winter when 1,500,000 customers all turn their gas taps on at once. Besides Beckton there are 12 other gas-works which pump gas into our enormous grid of mains some 6,300 miles in length."

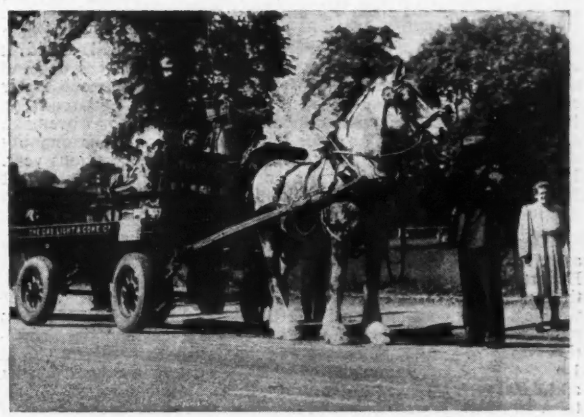
Intensive Gas Courses

Another of the Intensive Courses arranged by the Gas Education Committee of the Institution of Gas Engineers and recognized by the Ministry of Labour and National Service for the purpose of awards under the Government's Further Education and Training Scheme will commence at the Cambridgeshire Technical College and School of Art on Sept. 15. It is intended primarily for candidates who have obtained the Ordinary Grade Certificate in Gas Engineering (Manufacture), but candidates who have reached a standard approximating closely thereto may be admitted, subject to the approval of the Gas Education Committee and of the Principal of the College.

The Course will have the following time-table: Sept. 15-Dec. 20; Jan. 5-March 20; April 12-May 15. At the conclusion of the Course students will be required to pass examinations in ancillary subjects set by the College and in the main subject of Gas Engineering (Manufacture) set by the Board of Examiners of the Institution.

Those who intend to take the Course should apply without delay to the Principal of the Cambridgeshire Technical College and School of Art, Mr. R. W. Wilson, B.Sc.(Eng.), A.M.I.E.E., Collier Road, Cambridge, and advise the Secretary of the Institution that they have done so. As accommodation at this Course is limited early application is advised. It will be the responsibility of students to arrange their living accommodation, but if by Aug. 25 they have not been able to do so, they may apply to Mr. J. Hunter Rioch, Managing Director, Engineer and Secretary, Cambridge University and Town Gas Light Company, 52, Sidney Street, Cambridge.

Awards are payable under the Further Education and Training Scheme to persons who are eligible to cover the cost of the Course, the cost of necessary text books, examination fees and maintenance.



On the occasion of the Horse Parade in Regent's Park on Whit-Monday, the Gas Light and Coke Company entered eleven horses, all of which won Firsts in their respective classes. One of the entrants is shown above.

News in Brief

Strabane (Co. Tyrone) Urban District Council has decided to grant gas-works employees two weeks' holidays with pay each year in addition to six statutory holidays.

Sheffield Advertising Managers met in conference in the cinema of the Sheffield and District Gas Company on June 2, at the invitation of Mr. Ralph Halkett, General Manager. Mr. Halkett was unable to be present, and the visitors were welcomed on his behalf by Mr. Wm. R. Oliver, Public Relations Officer, Sheffield and District Gas Company. Mr. S. Hopkinson, Chairman of the North-West Branch of the Incorporated Advertising Managers Association, addressed the meeting on the work of the Association, and his address was followed by a lively and instructive discussion.

Mr. T. W. Barratt, Engineer and Manager of the Morecambe and Heysham Gas Department, in his monthly report, stresses the necessity of erecting a new gas-works at the earliest moment, pointing out that the increased consumption of gas has put an additional burden on the plant and emphasizing the grave difficulties in obtaining adequate materials for the efficient maintenance of the present works. The Morecambe Gas Committee has agreed with Lancaster to explore the possibilities of erecting new gas-works on or near the Middleton factory area to serve both Morecambe and Lancaster.

Representatives of supervisory and managerial organizations totalling 50,000 members, met in London on May 31 at the invitation of the Association of Supervisory Staffs, Executives, and Technicians to discuss the place of the supervisor and manager in a planned economy. It was agreed that there was an urgent need for close working through the medium of affiliation or confederation of all supervisory and managerial organizations, if they were to play their full part in the new plans for industry. A.S.S.E.T. has therefore agreed to call a further meeting to enable representatives to discuss and draw up a constitution for this purpose.

The Re-appearance of the Handbook of British Refrigeration Material and Refrigerating Catalogue in its first post-war edition will be welcome to many who need a guide to all sections of an industry in which much recent development has been made. This enlarged illustrated buyers' guide to all departments of the refrigeration industry is circulated widely overseas, and will be of service to exporters of refrigeration machinery and accessories. The inclusion in this well-printed and attractively bound volume of technical tables and refrigerating data will meet the needs of refrigerating engineers and others, and there is also added an up-to-date list of all the cold stores and ice factories in Great Britain. The price of this annual is 5s.

The Building Exhibition is to be held at Olympia, London, from Nov. 19 to Dec. 4 this year, after an interval of nine years. Of the stand space 95% is already booked, the exhibitors including firms long associated with the exhibition and concerned with every kind of material, method and mechanical aid in building, civil engineering and contracting. In addition to individual exhibits there will be displays by the Ministry of Labour, Ministry of Fuel and Power, and the Department of Scientific and Industrial Research. The Architectural Association is to have a stand of its own design to mark this year's centenary of the Association. The Chairman of the Exhibition this year is Sir Lancelot Keay, President of the Royal Institute of British Architects.

Sir Robert Chance, Chairman of the Gas Committee, speaking at a meeting of Carlisle City Council, said that during 1946 the gas undertaking had made 4% more gas than in the previous year. The maximum daily output had reached 3,392,000 cu.ft. which was also a record. Unless there were economies all round it would be very difficult for the Department to meet the demand next winter. The average consumption per prepayment meter consumer was over 29,000 cu.ft. compared with 20,000 cu.ft. in 1939. The quality of coal supplied had shown no improvement, although it was more than twice the pre-war price. The quantity of coal carbonized was 3,500 tons more than in the previous year. It had not been possible however to resume the extraction of benzole and the sulphate of ammonia plant was now so old that manufacture would have to be discontinued.

Addressing Members of Women's Organizations in the Carlisle area, Mr. J. G. Aitken, Engineer and Manager of the Carlisle Gas Department, stated that unless the saving target for gas was reached, there was a danger that local works would have to go on short time working. Gas consumption in Carlisle had increased by 30% compared with 1939, and the coal they had to use to-day contained sometimes up to 25% ash. Before the war, the Carlisle gas-works produced 14,000 tons of coke annually, of which 8,000 tons was used locally and 6,000 tons exported to Norway. Present production was 23,000 tons, all of which was consumed locally and in addition thousands of tons had to be brought from Newcastle-on-Tyne to keep the Carlisle area going. Mr. Aitken said that in some places people had to queue in the early hours of the morning for ½ cwt. of coke while others could buy up large quantities of coke and sell it at a profit in the black market. The Government had done nothing to stop this practice.

Scarborough Gas Company has applied to the Ministry of Fuel and Power for a further extension of the time allowed under the 1932 Scarborough Gas Act whereby the Company can apply for a revision of the basic price of gas.

Local Government Officials from Palestine, Czechoslovakia, Denmark, and Sweden who are taking a course at Southport on the British way of life as shown through the workings of the local government services spent half a day hearing lectures on gas undertakings and visiting the Southport Gas-Works. The British Council has arranged the course and the "behind the scenes" picture of Southport's gas undertaking was given by Mr. H. James Risby, Engineer and Manager of the undertaking.

A New Fulham Booklet was produced by the Gas Light and Coke Company for distribution to all members attending the Centenary Meeting of the Institution of Mechanical Engineers. A party of these visited the Fulham Works on June 13, and the booklet was written to stress the mechanical side of gas making which at Fulham is highly developed. The drawings were prepared by draughtsmen of the Gas Light and Coke Company's Distribution Department and were reduced for printing purposes.

Perth Town Council is considering the possibility of the Corporation gas-works supplying electricity for a portion of the town. Authority would require to be given for this, as the Town Council is under contract to take the whole of its electricity from the Grampian Supply Company. Mr. W. N. Baird, Engineer and Manager, indicates that following the modernization of plant, in which the generation of electricity for plant requirements has been included, it would be possible to generate more electricity than is needed for the works. The proposal is under discussion by the Town Council, the Hydro-Electric Board and the Grampian Company.

Action Has Been Taken by the larger Corporations in Scotland to put into effect the Government's request for a survey of man power requirements with a view to releasing labour for industry. These local authorities have been asked to make an "immediate review" to obtain a transfer of 80,000 employees into industry. Glasgow Corporation has established a sub-committee to carry out this work and it is anticipated that the Gas Department, like others in the city, will come under review. While some Corporations anticipated a sharp division of viewpoints others have indicated that they expect to carry the Government's requests into practice and that additional workers will be released for industry.

The Women's Gas Council has published a new leaflet in its series "I Pass this on to You," on the subject of fuel economy. The W.G.C. is anxious to support the fuel economy drive in every possible way, and has therefore devoted this number to setting out ways in which fuel consumption in the household can be cut by a quarter. In addition to the economy hints and instructions on meter reading, the leaflet contains suggested fuel-saving recipes for meals which require either very little or no cooking. Harry Rountree contributes an amusing addition to the leaflet by way of sketches in illustration of the various economies. To date 100,000 copies of the leaflet have been ordered by the Ministry of Fuel in furtherance of the fuel economy campaign.

A National Fuel Research Centre for coal-burning appliances may be established in Falkirk, the town recommended by the Scottish Fuel Efficiency Committee to the Ministry of Fuel and Power and the Department of Scientific and Industrial Research as the most suitable centre for the station. It was suggested that a site should be obtained in Edinburgh or Glasgow, but the Committee pointed out that Falkirk was the chief centre for the ironfounding industry, and made a big percentage of all the solid fuel-burning appliances used in Great Britain. It was also thought by the Committee that there should be decentralization of research, and that it should be linked up as far as possible with the industries concerned. At a recent meeting of the Fuel Efficiency Committee, Sir Patrick Dollan, Chairman, stated that devolution was as much needed in Scotland as in London, and he recommended Falkirk as ideal for fuel research.

The Need for a Proper System of technical education in Scotland was emphasized by Mr. J. Ferguson, H.M. Inspector of Schools, in an address which he gave to the Edinburgh Advisory Council for Continuation Schools at a meeting in the City Chambers, Edinburgh. There was a dearth of technical schools in Scotland, he said, because there had not been a demand for them. But industrialists and others were now realizing the value of technical training for their employees, and definite progress was being made in the provision of training courses. Technical education, Mr. Ferguson said, ought to be an integral part of the industrial set up, and not something that was detached and voluntary. Principal J. Cameron Smail, Heriot Watt College, also commented on the dearth of technical colleges in Scotland. There was talk about a fifth University for Scotland, but he was grieved to think there was not so much talk about the need for local technical colleges—which were one of the outstanding requirements in Scotland.

Infra Red Heating by Gas Exhibition

POSTPONED for obvious reasons from the period of the fuel crisis, the Infra Red Heating by Gas Exhibition, organized by the British Gas Council, was opened at Gas Industry House on June 19, and will remain open at least until the end of July, and possibly longer if necessary. The main features of the exhibition are two types of medium temperature infra red ovens which are widely used in industry for paint drying—the products of Parkinson & Cowan, Ltd., and of De La Rue Gas Development, Ltd. There is also a Matthew Hall tunnel of the G.L.C. type for low temperature work, 4 ft. in diameter, consisting of two 3 ft. sections, with a thermocouple on each panel so that the temperature of each section can be found by adjusting a dial. A scale model, 9 in. in diameter, of a 9 ft. by 3 ft. diameter tunnel is also shown; it was constructed at Watson House and has been used for experimental work.

The rest of the display comprises samples of the many articles in everyday use which are treated by infra red gas heating in the process of manufacture, ranging from lipstick holders to cycle frames, toy mangles to bathroom towel rails, and eyebrow tweezers to electric fires. The inclusion of several electric fires was in itself a novelty for a Gas Industry House show.

The trade and technical Press had a special preview of the Exhibition on June 18, when brief talks were given by Mr. J. R. W. Alexander, General Manager of the British Gas Council, Mr. Dean Chandler (South Metropolitan Gas Company), and Mr. A. J. K. Parker (Works Engineer of E.M.I. Factories, Hayes). The official opening was by Mr. William Leonard, Joint Parliamentary Secretary of the Ministry of Supply, on June 19, when the majority of the visitors were representatives of the national Press.

New Name for Old Principle

Colonel **H. C. Smith,** Chairman of the British Gas Council, presiding at the opening ceremony, said some people wondered what "infra red heating" really meant. What happened was that as old principles which had been in use for quite a long time were more scientifically developed a more modern name had to be attached to those principles. The Gas Industry had been familiar with radiant heating for many years, but infra red heating was to most of them "quite a new one." Apart from the purely technical aspect there was no doubt that the development and application of infra red heating did a most important job during the war years in speeding up manufacturing processes, and particularly in speeding up the drying of paint, in respect of which there had been serious bottle-necks. The infra red process enabled paint to be dried quickly without burning, and the exhibition provided many examples of how infra red could be applied. They were fortunate in that gas provided a very useful form of heat from which infra red rays could be obtained. The apparatus in which gas was used for that purpose was robust and comparatively cheap to manufacture, and economical to maintain.

Mr. **W. Leonard,** Joint Parliamentary Secretary, Ministry of Supply, in opening the exhibition, said it showed one most important way in which our industrial production could be considerably speeded up. The application of infra red heating to industry on a large scale was a comparatively recent innovation, and one which was already proving invaluable though, of course, the use of radiant energy for heating purposes, which was what it was in essence, was not new. This new use of radiant heat in industry was of importance to this country because it saved time, saved coal, and widened many industrial bottlenecks. The drying of the metal finish on bedstead frames which used to take 600 minues took eight minutes by the new method; the same process for agricultural machinery used to take 60 minutes and now only took six. This saving of time implied a saving of labour, saving of space and saving of overheads.

Advantages in the Ceramics Industry

He was particularly interested in the use of infra red for drying ceramics. Many of the drying processes in that industry took so long that they held up production, but the use of infra red heat had cut down the drying time from a matter of days to a matter of minutes. This had brought along another advantage—the saving of space occupied by the drying plant. Previously, large drying rooms had to be used and often the drying area was larger than the area taken up by the actual manufacture of the articles. When radiant heat plant was used the space released could be used for casting and manufacture, thus increasing production considerably without addition of plant or building. Saving of coal arose out of the fact that this new method of industrial heating took advantage of the main characteristic of gas, namely, that it produced a large quantity of heat in a short space of time. From the national point of view gas in a number of applications was the most economical and efficient way of making use of our precious coal.

In considering the importance of this new development they must also consider possibilities for our export trade. There would, no doubt, be a call for this type of equipment from abroad, and its importance from this aspect to the national economy should be kept under review. The British Gas Industry deserved the greatest credit for this new use of radiant heating. During the war, and since, it has produced an uninterrupted supply of gas although, of course, in one or two districts the output has had to be lowered for reasons outside the Industry's control. During the recent fuel crisis the Government asked the Industry to reduce carbonization of coal for 10 weeks by as much as 10%. The Industry responded magnificently and reduced not by 10% but by 12%, thus saving 625,000 tons of coal.

A Realistic Display

Mr. **J. R. W. Alexander** said there was nothing "phoney" about the exhibition; all the articles shown were in actual production, and had not been specially produced for the occasion. Great difficulty had, in fact, been experienced because the manufacturers concerned were too busy with production to bother about exhibitions. The exhibition was unique; he was not aware that there had ever been a public demonstration of infra red heating before. It was on a small scale, because they wanted to keep it within the limits of that building, where the necessary technical information could be given and where they could keep it open as long as necessary.

The first development of infra red had taken place about 18 years ago, when the Gas Light and Coke Company, to everybody's amusement, constructed a plant for the drying of banknotes, and banknotes were still being dried by infra red. The developments which had taken place afforded a fine example of true co-operation between the Gas Industry, the makers of the plant, and particularly the users of the plant. The results of that co-operation had been to the mutual advantage of the three parties, and the process had literally converted hours into minutes. The exhibition comprised only two examples of actual plant, made in different forms by different makers. The plant was fully working, excepting that the heat was not there, because owing to restrictions they could not apply heat of the required intensity in that building. Of the smaller models, however, one 18 in. long was in full operation with heat, and had, in fact, been used by a jeweller. Larger units were large enough to take the whole of the prefabricated side of a house.

There were present at the exhibition technical and commercial development officers from the Industrial Gas Development Centres throughout the country—another example of co-operation—some of which had been operating for 20 years, in which representatives of the Gas Industry, makers, and users of plant collaborated in order to apply gas to their particular industrial needs. Infra red was by no means the only industrial application, and it was the duty of those officers to provide without charge to the users of gas full technical, unbiased opinions as to the directions in which gas could be used for their particular purposes.

The afternoon of June 19 was devoted to a Press view by representatives of women's magazines, when a short address was given by Mr. R. F. Hayman (Gas Light and Coke Company, Watson House), copies of whose Paper on "Recent Developments in Radiant Heating for Industrial Processes" were available for those who wished to study the subject more extensively.

The exhibition is open daily to the public and to conducted parties organized by gas undertakings, and technical representatives of the Gas Light and Coke Company and the South Metropolitan Gas Company are in attendance to give advice on radiant heating and other industrial gas problems.

North of England Auxiliary

The 47th Half-yearly Meeting of the North of England Gas Managers' Association (Auxiliary Section) was held at the Demonstration Theatre of the Newcastle-on-Tyne and Gateshead Gas Company on June 13, under the Chairmanship of Mr. J. R. Cleator (Southbank and Normanby).

The Chairman delivered his Address, a vote of thanks being accorded to him on the proposition of Mr. R. W. Perks (Stockton), seconded by Mr. Graham (Newcastle).

Mr. Bernard Richardson, Newcastle-on-Tyne, was elected Chairman and took over the meeting, the other officers elected being: *Vice-Chairman*, W. O. Kirkwood (Sunderland); *Member of Committee*, Stanley Jones (Middlesbrough); *District Education Committee*, W. O. Kirkwood, B. Richardson, and F. J. Webster; *Hon. Secretary*, L. M. Weldon (West Hartlepool).

A vote of thanks to the Newcastle and Gateshead Gas Company for accommodation was proposed by Mr. S. Jones (Middlesbrough) and seconded by Mr. T. T. Tarn (Darlington).

After the business meeting the members, at the invitation of the North Eastern Electric Supply Company, visited the Dunstan Power Station and were afterwards entertained to tea. A vote of thanks to the Company, Mr. Morrell, Engineer, and his staff, was proposed by Mr. Bernard Richardson and heartily carried.

Junior Associations' Activities

FEATURES of the July issue of "GAS," published to-day, are a full report of Dr. Harold Hartley's Address on "Thirty Years of Progress by Evolution," with discussion, a Paper by W. J. Parsons (Birmingham) on "Gas and the Water Heating Field," and Miss Maywen Godby's Paper on "The Woman's Point of View."

Eastern Juniors

The newly formed Eastern Junior Gas Association has made a promising start. The report of the first annual meeting held at Peterborough records that J. S. Marshall (Lincoln) has been appointed first President, with H. J. Patching (Peterborough) and J. T. Brookes (Norwich) as Vice-Presidents, and R. W. Hilham (Colchester) as Hon. Secretary and Treasurer.

London's New President

To shorten its title, the London and Southern *District* Junior Gas Association dropped the word "District" at its annual meeting, at which the rules were revised so as to permit members of contracting and appliance firms with specified qualification to become Associate Members. Mr. C. A. Deas, of the Southgate station of the Tottenham and District Gas Company, was elected President to succeed Mr. G. G. Warne (Portsmouth), Mr. L. J. Clark (Gas Light and Coke Company, Beckton) becoming Senior Vice-President, and Mr. A. H. Savill (Wandsworth) Junior Vice-President. With experience of two very successful Conventions the members informally discussed future plans and left it to the Council to decide what form, if any, the 1948 Convention should take.

Thirty Years' Progress

We have already published in the "JOURNAL" a summary of the Address on "Thirty Years of Progress by Evolution," which Dr. Harold Hartley, now President of the Institution of Gas Engineers, gave to the annual meeting of the London Juniors. The full Address and discussion present a much more complete picture of the ground that has been covered since the middle years of the first great war. Although, unlike other industries, the Gas Industry has seldom produced any spectacular change it is clear that the appliances of to-day bear as little resemblance, either in appearance, design, or efficiency, to those of 1917 as does the present day motor car to the contrivance of those days. In some ways they have become more complicated, but research and development have produced greatly increased efficiencies while design has kept pace with normal evolution. That we have not yet reached the limit of advancement is shown by the hint which Dr. Hartley gives of the further increase in the efficiency of new models about to be marketed.

Woman's Viewpoint

Miss Maywen Godby's Paper on "The Woman's Point of View" to the London and Southern District Junior Gas Association was the first to be presented to the Association by a lady member, and the innovation was a great success, both from the point of view of the Paper itself and the discussion it aroused. Aiming at drawing attention to factors which should be considered when designing appliances meant to be used by women, the Paper attributes to makers of gas equipment an erroneous idea of the average size of a woman. Too little research was carried out, for example, before the normal height of 3 ft. for cooker and table tops was decided, because 33 in. would be better. Other examples of equipment obviously designed and arranged without due regard for the "average woman" are slot meters fixed unreasonably high or in inaccessible corners, and drying cabinets so tall that the smaller woman cannot set the thermostat correctly.

Water Heating

Basic principles of hot water engineering and their application to gas are examined from the practical angle by W. J. Parsons, Water Heating Superintendent of the Birmingham Gas Department, in a Paper on "Gas and the Water Heating Field" to the Midland Junior Gas Association. Dealing with his subject from the point of view of the domestic, commercial and industrial loads, he avoids argument as to storage *versus* instantaneous water heating in the home, pointing out that the choice must depend on individual circumstances. Selection of a suitable instantaneous heater is not difficult, provided the appliance is adequate for requirements, but the selection of a storage heater is less simple and involves consideration of storage capacity and the recovery rate of the boiler. In the commercial field the Author deals with conversions from solid fuel to gas firing, the principles of central heating, controls, and running costs. In Birmingham there is a substantial industrial water heating load, and under this head the Author covers direct heating of solution tanks, hot water for batter mixing, steam raising for cooking purposes, and coil heating of solution tanks, ending with emphasis on the importance of appropriate insulation.

British Gas Staff Association

The first Annual Conference of the British Gas Staff Association was held in the Assembly Hall of the Royal Empire Society, Northumberland Avenue, London, on May 31, over 200 delegates assembling from all parts of England, Wales, and Scotland.

The **Chairman**, Mr. W. E. Webb, J.P., said that he doubted whether any other organization of its kind in this country had succeeded in less than 12 months in achieving so much in attracting membership or putting its impress on the affairs of an industry. The membership, recruited from the administrative, professional, technical, clerical, and supervisory staffs of the Industry, had risen rapidly in number to over 11,000, and 95 branches and 12 regional councils now organized the affairs of the Association under the direction of the National Council. The Association had almost achieved a 50% membership of the staff of the Industry and there was evidence that it would shortly be able to claim to represent the majority of gas staffs throughout the country. The rapid growth of the Association necessitated the appointment of two senior officials, namely Mr. H. J. Arnold, National Organizer, and Mr. F. C. Henfrey-Smith, General Secretary. Enquiries were now being made to acquire suitable office premises in London to house the staff necessary to conduct the increasing business of the Association.

Loyalty to Employers

Regarding the prospect of nationalization, the Chairman said the position of the Association was that, as long as the Industry was controlled by private companies or local authorities, its members would be loyal to them and would co-operate with a view to the increased efficiency of the public service. Immediately the Industry was nationalized, the members' loyalty would, as employees, be due to the State, and the Association would work with the State for the general improvement and betterment of all. Representing the employees of the Industry, the Association would strive to obtain the best possible levels of salaries and conditions of employment for its members, whether the employers were private companies or the State. But the Association was strictly non-political and, therefore, made no statement of policy for or against the proposal to nationalize the Industry.

One of the leading Parliamentary Solicitors has been engaged as consultant to guide the Association in presenting to the Ministry of Fuel and Power the various points it wished to make on behalf of its members. The position of employees in joint gas and electricity companies, which will be nationalized with the electricity industry, is being carefully watched and representation has already been made to the Ministry on their behalf.

Success has been gained in local and regional negotiations, but it has been decided that, especially in view of the probable nationalization, future negotiations on matters of general application should be on a national basis. The Association is a registered trade union whose *bona fides* are now recognized by the other trade unions with which it associates. Together with other trade unions with membership among gas staffs, application was made to the Federation of Gas Employers for the formation of a National Joint Council for Gas Staffs. It was considered by the delegates to the Conference that it was a great achievement to have gained national recognition in so short a time, but since application for the National Joint Council had been made in November, 1946, concern was expressed at the delay in setting up the Council. The meeting was assured that all possible steps were being taken to expedite the formation of the Joint Council and the implementation of a national salary scheme would be urged.

Gas Salesmen's Pay

The Ministry of Labour had set up a Commission of Enquiry to investigate the desirability of a Wages Council for the Retail Furnishing and Allied Trades, to include the sale of gas and electric appliances. The British Gas Staff Association had given evidence to show that it would be, in its opinion, detrimental to the staff to be included under the scope of the Wages Council owing to the specialized technical training necessary for gas salesmen.

The Financial statement was presented by the Hon. Treasurer, **Mr. T. R. Robson,** who stated that, although a reasonable balance was shown on the last nine months' working, it was considered necessary, in view of the increasing costs of the Association and the widening of its activities on behalf of its members, to recommend an increase in subscriptions.

It was considered by some delegates that employees should have a greater part in the organization of the Industry and its management. It was stated that the Association would request representation on the National and Regional Boards if the Industry was nationalized.

The Association was requested to endeavour to form voluntary schemes for sick and accident funds and also a superannuation fund as many employees in small undertakings did not receive such benefits as conditions of service.

The following officers were elected for the ensuing year: *Chairman*, W. E. Webb, J.P. (Gas Light and Coke); *Vice-Chairman*, C. C. Holt (York), succeeding P. Stephenson (Croydon); *Hon. Treasurer*, T. R. Robson (Commercial); *Hon. Auditor*, G. Lovell (Gas Light and Coke); *Hon. Auditor*, H. L. Bristow (Commercial).

Yorkshire Gas Coke Association

Annual Meeting and Luncheon

THE Sixth Annual Meeting of the Yorkshire Gas Coke Association, on May 29, at Leeds, was preceded by the Second Annual Luncheon, both events taking place at the Great Northern Station Hotel, Mr. G. E. Currier, M.B.E. (Engineer and Manager, Bradford Corporation Gas Department), presiding.

Chief guests at luncheon were Colonel H. C. Smith, C.B.E., Chairman of the National Federation of Gas Coke Associations; and Mr. J. W. Beaumont, Deputy Chairman, National Smoke Abatement Society and Chief Sanitary Inspector, Halifax.

Colonel **Smith,** proposing the toast to the Yorkshire Gas Coke Association, said that in his capacity as Chairman of the National Federation he had the opportunity of seeing and recognizing the work done by the various district gas coke associations and he very much admired that work. With the exception of the London Counties, they had all come into being during the war years and for that reason had never yet had full opportunity of carrying out the functions they had imposed on themselves as their primary purpose.

"You have not, for instance (said Colonel Smith), yet had opportunity of choosing the coals you would like to carbonize and prepare for the coke market, in the way you know it should be done. Your job, indeed, has been in the direction of restricting sales rather than developing them, which was certainly not the objective of your creation but which circumstances of the times have forced upon us.

"Although you have not so far been able to do the actual job you were designed to do, I do not know what would have been the position in the Gas Industry but for the formation of these coke associations and the collaboration between them in speaking with one voice to the Ministry of Fuel and Power. When the demand came for the dispersal of coke to be programmed we were able to say that we could take on this job, unpleasant as it is, instead of its having to be done by the Ministry, and that has been the most important job you have been able to take on so far.

"The relationship between the Yorkshire Gas Coke Association and the National Federation and the other associations is a very important one. In the Federation we have always realized that the strength of the movement in a national sense depends on the level of efficiency of each individual district association. It takes a long time to establish an efficient trading organization of this kind. The London and Counties Association did have a run of something like nine or ten years before the war started and it was thus able to get into its stride quickly, but even so we found the difficulties to be overcome were enormous. One recognizes that the success of any association of every kind must depend on the mutual trust and goodwill of its members and we have ample evidence that we possess those factors in this movement.

"To-day (continued Colonel Smith) we are faced with something more serious than voluntary control in the comparatively near future, if this Government remains in power long enough. I hope we shall be able to show that the coke associations can do what is necessary efficiently on a voluntary basis and that even if we do come under Government control we should be upset as little as possible. A certain amount of control is, I suppose, necessary, but it must not be overdone, as regulations have been overdone on some occasions."

Waste of Money and Manpower

Mr. **Currier,** responding to the toast, said the Industry and its societies were going through a difficult time. They had had the Simon Report, one of the finest reports ever presented by a Government-appointed Committee in its advocacy of the use of coke, but unfortunately the present situation was such that the producers of coke were unable to meet demand by supplying either the quantity or quality of coke that they would wish to do.

"I suppose one may say," commented Mr. Currier, "that at a modest estimate the ash content in coal has gone up at least 5% since pre-war days, and now we have the National Coal Board aiming at an output of 200,000,000 tons of coal per year, which unless they can plan to get us some cleaner coal will mean carting around the country some 10,000,000 tons of inert and useless material, spoiling our product and wasting manpower and transport. We must hope the N.C.B. may soon be able to supply us with a cleaner coal so that we can supply a better coke."

In the very bad period of the past uncommonly bad winter (Mr. Currier continued) he felt it could be claimed that the Gas Industry had fully justified its slogan "Public Servant No. 1," and that its prestige had been enhanced by its service in the great fuel crisis.

Mr. **Norman Hudson,** Deputy Chairman, Yorkshire Gas Coke Association, proposing a toast to the Guests, said it was a pleasure to invite their coke industry contacts and friends to share a lunch with them. The members would like to have been able to tell them more of what they were doing, but an explanation had been given by Colonel Smith as to why they had not yet been able to do all they set out as their main functions when the coke associations were originally established.

After paying tribute to the vital part played by Colonel Smith in the creation and development of the gas coke associations, Mr. Hudson said the Yorkshire Association was glad to entertain representatives of the coke distributive side and fully realized what a "headache" that side had been having in recent months —though probably not more than that of the producers.

Mr. Beaumont was particularly welcome as representing two important services—the sanitary service and the field of smoke abatement, both of which were closely allied to certain phases of the Gas Industry, and especially that of coke as a smokeless fuel. Mr. Beaumont, the speaker believed, had given many years' valuable work as Secretary of the Council of the Smoke Abatement Society and was now its Deputy Chairman, an honour well deserved; and they would all wish him well in his efforts to achieve a cleaner atmosphere in this country.

Smoke Abatement Efforts

Mr. **Beaumont,** replying, and speaking of efforts towards smoke abatement by the greater use of gas and coke since he had come to Halifax, recalled a special housing effort some twelve years or so ago when, in conjunction with Mr. W. B. McLusky, Gas Engineer at the time and father of the present Gas Engineer, Mr. J. MacLusky, member of the Committee of the Yorkshire Gas Coke Association, they were able to persuade the Corporation to fit up one of the housing estates with fire grates designed specially for coke burning. The aim was good, but unfortunately they were still up against old-established prejudice, and at the end of a year they regretfully found that only about 10% of the people on the estate were using the grates for coke. The remainder were burning raw coal, with its inevitable smoke and, in this case in particular, entirely needless waste.

The National Smoke Abatement Society (Mr. Beaumont added) had recently adopted a new constitution involving divisional organization in areas. The Yorkshire Area Divisional Committee was to be elected shortly. Provision was made for co-opting representatives of movements kindred to the movement and he hoped the Yorkshire Gas Coke Association would receive an invitation to have a representative on that Yorkshire Divisional Committee. If that occurred their work together would become closer than ever.

Despite all the difficulties being experienced in present times, added Mr. Beaumont, it was surprising how they could, with thought, gain something out of adversity. For a long time past, and particularly under the coal difficulties now prevailing, he had used every possible opportunity towards persuading property owners in this district to take out the old Yorkshire coal fire grates and replace them with something to burn smokeless fuel. He was in a rather favourable position to do this because he happened to be the local licensing officer for property structural work to cost over £10. It was surprising and gratifying to find what a lot of people, under pressure of the coal difficulties, were now realizing how wasteful was the old coal fire grate. Hundreds of people had had them replaced by more modern equipment and such a time must be taken full advantage of in the campaign for use of smokeless fuel.

"We are grateful for the increasing amount of attention now being given by Government and other authorities to the problem of atmospheric pollution and its reduction," said Mr. Beaumont. "Despite all present-day discouragements I feel there is a growing appreciation on the part of the public in recognizing the value of any fuel which reduces pollution and it is certain that nothing contributes more to that end than gas and coke."

Mr. **C. S. Shapley,** Engineer and General Manager, Leeds Corporation Gas Department, proposing thanks to the Chairman of the Yorkshire Association (Mr. Currier) and his Committee for the work they had done, and to Mr. Currier personally for presiding, said in Leeds they had had the same unhappy experience as that mentioned by Mr. Beaumont in the effort to overcome the coal fire prejudice. They had in Leeds the biggest municipal colony of flats in the country—perhaps in the world; 950 residential flats, every one of which had been fitted with coke-burning grates, but it was still found that a large proportion of the tenants persisted in burning raw coal in them. Much good work had been done, but there was a lot more still to do.

Mr. **Currier,** responding, said the job was not an easy one and it was only with the wholehearted support of all the members that it was possible to go ahead with what they aimed to do. It was entirely a matter of teamwork.

At the annual general meeting, following the luncheon, Mr.

G. E. Currier was re-elected Chairman of the Association, an office he has held since its inception six years ago.

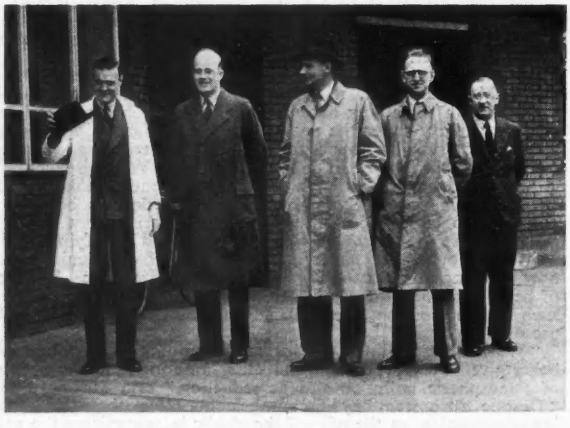
Mr. Norman Hudson (Mirfield) was similarly re-elected Deputy Chairman; and Messrs. J. E. Lister Cooper (Yeadon), Ralph Halkett (Sheffield), and A. McDonald (York-Harrogate Group) were re-elected to the Committee on the expiry of their previous term. Mr. A. L. Jennings (Spenborough) was unable to accept nomination for a further period on the Committee and there is thus a vacancy to be filled at the next meeting of the General Committee in July. Thanks were expressed to Mr. Jennings for his service on the Committee from its inception.

The Annual Report and accounts, submitted by the Secretary (Mr. C. L. Davies, of Leeds) and audited by Messrs. Starkie and Naylor, of Leeds (re-elected Auditors), were adopted.

Southern Association (Eastern District) County Meeting

THE County Meeting of the Southern Association of Gas Engineers and Managers (Eastern District) was held this year at the works of the Slough Gas and Coke Company, of which the District Chairman, Mr. J. H. Dyde, is Engineer and General Manager. About 100 members, including Mr. F. Dawson, President of the parent Association, assembled at the works in the morning and inspected the principal features, particular interest being taken in the new carburetted water gas plant now under construction, and the new sector dischargers working on the vertical retorts, which were described by Mr. W. W. Chisholm, Works Manager, in a recent Paper to the Eastern District.

In addition to the water gas plant a new water gas relief holder of 50,000 cu.ft. capacity is under construction and a Whessoe-Woodall Duckham electrostatic detarrer of 5,000,000 cu.ft. per day, to treat the combined coal and water gas, is on order. It is intended to make the Slough works the major manufacturing station for the area west of London under the control of the South Eastern Gas Corporation. Under this scheme gas will be supplied in bulk to the Windsor Royal Gas Company and the Maidenhead area of the Uxbridge, Maidenhead, Wycombe and District Gas Company. Under the Abercrombie Plan for Greater London, Slough is scheduled to reach a population of over 100,000, or about double its pre-war population. To cope with the demand for gas which will follow, a preliminary scheme for the extension of the Slough works to produce the maximum amount of gas on the land available has been prepared. The scheme provides for a new vertical retort bench of 3,000,000 cu.ft. per day to be built on the site of the now derelict horizontal retort house, a third water gas plant bringing the total water gas production to 3,000,000 cu.ft. per day with one plant as standby, new compressor and exhauster house, together with condensers, washers, and purifiers arranged in four streams of 2,250,000 cu.ft. each. The total manufacturing capacity will be 10,000,000 cu.ft. per day.



Mr. J. H. Dyde (Chairman of the Eastern District) with Mr. F. Dawson (President of the main Association) and other visitors.

After the tour of the works the members travelled by coach to High Wycombe where they were entertained to luncheon at the Red Lion Hotel.

Mr. **Dyde,** in welcoming the guests, recounted the history of the Slough works over the past ten years and paid tribute to Mr. Wilkinson, who for over 30 years until June, 1944, controlled its destinies. Before the war, he said, Slough works was a prim, efficient producing station, expanding at a rate well above the average due to the growth of light industries on the Trading Estate and an increasing population which gave the Borough its Charter in 1938. Then came the rearmament drive followed by war itself, with a steeply rising demand for gas, chiefly for industrial purposes. New plant had to be rushed in with little opportunity for careful and considered planning during those difficult days when bombs were falling with such havoc, and when contractors' resources were taxed beyond capacity. But

Mr. J. D. C. Woodall and Mr. J. W. Townsend lead the way on a tour of inspection.

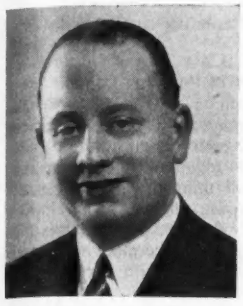
a greater difficulty than that of putting in new plant was that of securing the labour to operate and service it. Actually, it went to work entirely with trainees brought over from Eire. That supplies were maintained throughout the war was due largely to the sterling work of a few key men, but by the end of hostilities abnormal depreciation and general arrears of maintenance had reached a crippling stage. Mr. Wilkinson and he successively, like Christian in Bunyan's allegory, floundered in the "Slough of Despond." There, as it was written, they "wallowed for a time, being grievously bedaubed with dirt," but, like Christian, help came to them, this time personified by their good friends, the Gas Light and Coke Company.

During the war years 10 miles of transmission main were laid linking Southall Works via Uxbridge to Slough. When they, at Slough, had come to their lowest ebb, the Gas Light and Coke Company had recovered sufficiently from the effects of war damage to be able to afford them the necessary supply of gas during the summer months to enable them to shut down large sections of plant and undertake necessary repairs. With the small amount of resetting they had to carry out this year they would, during three summers, have either completely reconstructed or reset the whole of their retorts.

Looking at the future, he would be happy if they could change the name of "Slough." He envied "Brighton"—the psychological uplift of its name alone, quite apart from its salutary breezes, must be worth at least a penny a therm in production costs. Could anyone suggest a name for them when they built their Utopia? They had left Slough and passed from a scene of industry to the historical township of High Wycombe, an admirable background to the old craft of chair and furniture making, to which had now been added light engineering and electronics, and he thanked those who had invited them to visit their works later in the day.

Mr. **F. Dawson,** President of the main Association, proposed a vote of thanks for the hospitality afforded by the Slough and Uxbridge Companies.

The members then proceeded in two parties to visit the works of Broom and Wade, Ltd., manufacturers of air compressors and tools, and to those of Ernest Turner (Electrical Instruments), Ltd., manufacturers of high precision tools. Both parties spent a pleasant and informative time. The members again assembled at the Red Lion Hotel when tea was served and Mr. H. J. Escreet voiced the thanks of the Association to the Chairman.



Electricity in the Gas Industry*

By G. M. RIMMER, A.M.I.E.E., M.American I.E.E.,
Electrical Engineer, City of Birmingham Gas Department

DURING recent years, a great deal has been heard of electrical development, but, in general, the Gas Industry has been rather tardy in applying electricity to its works and has not kept abreast of recent electrical practice. The electric motor as a prime mover is gradually superseding the steam and the gas engine, and the change to electric motors would be greatly accelerated if the benefits of electric drive were fully appreciated and if gas engineers could be convinced that electric power can be as reliable as steam.

Industrial electrification is usually carried out in a very haphazard manner and without any basic planning, so that the service has little semblance of efficiency or reliability, with the result that many vital drives are still powered by relatively inefficient, but highly reliable, steam or gas engines.

As the question of reliability is of primary importance on gas-works, it is the aim of this Paper to put before gas engineers a service of maximum reliability which will also assist them in their constant search for increased, all-round, thermal efficiency.

It should be emphasized that the design, application, and maintenance of electrical plant and its associated equipment demand the services of a qualified electrical engineer working alongside the gas engineer, whose duties are already very onerous. Any prejudice against such a liaison should be completely forgotten, especially by the gas engineer whose achievements in overall thermal efficiency lead by so large a margin.

Sources of Electric Supply

(A) Public Supply

Public electricity can now be made available on almost every site with which the gas engineer may be concerned, but the choice is limited to high-tension supply (A.C.), at voltages up to 33,000 (3,300, 6,600, 11,000, 22,000, or 33,000), or low-tension supply (A.C. or D.C.) up to 500 volts. From the point of view of reliability, high-tension supply is most desirable, as it is invariably part of the main distributing system of the local electric supply authority, and as such is controlled with great care; also, most high-tension cables form part of a ring-main system fed from both ends, so that in effect a duplicate supply is provided. This duplicate supply is not, of course, absolute, inasmuch as ring-main cables are very often fed through a common transformer (situated at the electric generating station), which, if subjected to an electrical fault, will cause total failure of supply; this is a very remote possibility, but nevertheless it should be borne in mind, and if a duplicate supply be desired, care should be taken to see that entirely separate feeds are available. High-tension supply offers great advantages where motors are being installed, and wherever possible it should be first choice: low-tension supply can seldom be duplicated; it offers serious limitations to motor drives, and should be avoided at all costs.

(B) Private Generation

Private generation has, unfortunately, been discouraged by most electric supply authorities in the interests of load building and regardless of whether or not it was economical or desirable; also, many works engineers have been very ready to accept a seemingly cheap tariff so as to be rid of the responsibility and trouble which is certainly involved in the production of a private electric supply. From an engineering point of view it is only necessary to justify private generation on the ground that it provides a stand-by service, and in this respect gas-works auxiliaries can be considered to be of no less importance than those of electrical power stations which, almost without exception, possess stand-by house-service plant. Private generation provides a sense of security that cannot be obtained by any other means, and if careful thought be given to its installation considerable economies can be effected.

The choice of voltage for stand-by A.C. plant very often presents some difficulty, and with all but the larger units (*i.e.*, of more than 500 kW) it should, without exception, be that of the general works installation (usually of about 400 volts) in order that a minimum of equipment may be required.

(C) Combination of Public and Private Supplies

Whether public or private supply is being considered it is essential that at least a duplicate service be provided; this is not always possible and in any case simple duplication represents but a very inefficient and inflexible system. Something better than a simple stand-by service is required for such plant as exhausters, where an interruption during change-over to stand-by plant would be considered very serious. It therefore becomes imperative to employ both public and private supplies in such a manner as will enable automatic change-over from one system to the other without any interruption. This can be achieved by parallel operation, two sources of electrical energy being readily available, one of which is independent of any irregularities which may prevail on the works. In such circumstances, it may reasonably be assumed to be as reliable as a supply of steam from waste-heat or fuel-fired boilers.

Paralleling of Public Supply and Private Generation

(A) Principles and Equipment

The fundamental principle of operating two electrical systems in parallel is exactly the same as running two electrical generators in synchronism; the process is extremely simple and can generally be applied to existing A.C. generating plant with very little modification. The conditions that must be observed for parallel generation are chiefly concerned with the initial installation, and it is necessary to see that a common voltage is available on both supplies; also, due care must be taken, when making permanent connexions, to see that the phase sequence is correct, *i.e.*, that red, yellow and blue phases are connected together in correct order. In every case, however, where parallel operation is contemplated, the local supply authorities must be consulted, and they will be found to be most helpful in every direction.

With regard to equipment, the main items required are synchronizing and protective gear; the main switchgear must, of course, be robust enough to withstand the capacity of the incoming supply, and governor gear must be capable of coping with speed ranges corresponding to frequencies of between 48 and 52 cycles per second; otherwise, no special equipment, other than that required on standard generating plant, is needed.

(B) Complete Unity and Flexibility of Supply

The control of any A.C. generator is carried out solely by means of the steam input; as the speed of the machine drops when additional load is being taken up the governor opens the steam valves and allows an increased supply of steam to pass into the turbine, thus bringing the speed back to normal. This process requires a certain amount of steam storage, and unless proper storage facilities are available there is considerable loss of efficiency. With parallel operation the speed of the generators is kept constant because of synchronization with the electrical grid, and any additional load requirement is automatically met by the public supply: this enables boiler plant to be run at constant load and maximum efficiency. In this manner complete unity of supply is achieved, the flexibility of both steam and electrical plant being obvious and requiring little, if any, manual attention.

(C) Method of Operation and Advantages

First of all it is necessary to switch the two systems together, and this is done in exactly the same manner as for two generators; this is called synchronizing and requires that the electrical speeds (frequency), voltage and phase relationships (as shown by a synchroscope) be identical. When the two supplies are switched together, load control is carried out by means of the governor on the steam side; if a surplus of steam is available, additional current is generated

* From Communication No 316 of the Institution of Gas Engineers

and exported to the public supply; similarly, if a deficiency of steam is apparent, current is imported from the public supply, both processes being entirely automatic. Should either supply fail, the automatic protective gear will open the corresponding switch and the plant will then be running, without interruption, on the remaining supply: when supply is restored, synchronizing procedure is again necessary (this can be carried out in a few minutes), before the two systems can again be operated in parallel.

The advantages to be gained by the gas undertakings are many and can briefly be outlined as follows:

1. Continuity in operation of all electrically operated plant.
2. Considerably reduced electricity charges, payment being received for exported energy.
3. Maintenance of electric plant considerably reduced because of less frequent starting operations.
4. Load factors on generating plant can be increased substantially, thereby raising the efficiency and reducing running costs.
5. Where duplicate supplies are already in existence with dual cabling, distribution losses can be reduced and cable capacities immediately increased.
6. Steaming conditions of all boiler plant greatly improved, especially where dust burning boilers are used, because of constant loading conditions.
7. No stand-by steaming capacity is required, it being readily obtained by reducing the load on the generating sets; thus a 100 kW generating set will provide a stand-by steam capacity of at least 1,400 lb. per hour.

The electric supply authorities are, of course, at some disadvantage with this scheme from a financial point of view, inasmuch as their load factor is very low; but the national interest should predominate in this respect, and the contribution which the Gas Industry as a whole can make, both by reduced demand and export of surplus energy, is worth their consideration.

(D) Practical Experience in Birmingham

In November, 1945, two 400 kW sets installed at Saltley Gas-Works were first operated in parallel with the Birmingham Electric Supply Department's high-tension mains at 11,000 volts and since that time only one interruption to supply has been recorded; this was avoidable and should not have occurred. Nechells Works generator, of 600 kW capacity, was paralleled in February, 1946, and there is no record of any interruptions. In April, 1946, two 1,000 kW sets at Windsor Street Works also were paralleled, and again there is no record of any interruption having taken place. Over this period of about 12 months, charges for public supply have been reduced by at least 50%, and some 3.6 million units have been exported to the electric supply department, for which an average price of 0.41d. has been received: steam consumption per kW generated has been considerably reduced, and at Nechells Works the reduction has been of the order of 40%.

In the case of Windsor Street Works, steam has been in short supply, and shutting down of the electrical power house has been necessary on several occasions; this has been carried out without any interruption to works plant, and has assisted in no small measure with works steam problems. In general, it can be said that the various station engineers have been completely satisfied with the electric supply system.

Generation of Electric Power on Gas-Works

(A) Choice of Supply and Voltage

The A.C. drive offers such outstanding advantages over D.C. in every respect except speed control and efficiency, that prime consideration should be given to A.C. generation, which, of course, necessitates constant-speed drives; variable speed requirements of the Gas Industry are definitely in the minority and can be met individually rather than that the whole plant should be subjected to the D.C. system. A three-phase 50-cycle supply is essential for alternating current, and, concerning voltage, although works conditions are severe enough to justify a power voltage in the neighbourhood of 110, British motor practice dictates a standard of approximately 400 volts: the most suitable voltage is 415 across three phases, with a neutral point giving a single-phase supply of 240 volts. Up to about 750 kW it is essential to generate at this voltage, but where a works covers a large acreage and the capacity exceeds this figure, high-tension generation should be considered on account of the economies which can be effected on main distribution cables.

(B) Gas-engine Drives

Gas-engine drives are sufficiently well known on gas-works, and it is only proposed to state that they are completely unsuitable (in the small sizes) for the generation of alternating current which is to be paralleled with a public supply.

(C) Steam Drives

(i) Operating Efficiencies

Present-day gas-works practice of steaming at low pressures between 60 and 150 lb. per sq. in. has no doubt been a compromise between low pressures for retort and producer requirements and medium pressures for mechanical drives. Small units of 75 kW capacity are commonly found with non-condensing engines which have a veritable thirst for steam of the order of 60 lb. per kW, this high consumption being largely due to the inefficient thermodynamic cycle and, in a smaller measure, to low load factors and varying steam conditions.

With average working conditions it is almost impossible to achieve an overall long-term efficiency greater than 10% on small non-condensing plant.

With the larger units, condensing plant is invariably in operation, so that the basic efficiency can be raised to about 25% when the back pressure is of the order of 26 in. vacuum, giving an achieved thermal efficiency of approximately 21% and an overall long-term efficiency of about 15%. While this shows a considerable decrease in steam consumption, it still presents an appalling waste of energy. Even with the largest units up to 100,000 kW, as used by electric supply undertakings and employing many stages of feed heating, high initial pressures (2,500 lb. per sq. in.), vacuum of the order of 29 in., superheat temperatures up to 1,000° F. and most efficient reheat and binary vapour cycles, it is still not possible to achieve a thermal efficiency very much greater than 30%.

In a normal condensing plant the major losses are due to the turbine exhaust where the latent heat is discharged to the condenser; hence the necessity of conserving this heat energy in order to realise high efficiencies. This can be very easily achieved on many gas-works by using back or bled pressure engines and turbines because of the continuous and relatively large demand for process steam. The highest efficiency is obtained by the pure back pressure system.

The subject of power from process steam is well known, and there is little to say which would be new; care must, however, be taken when selecting back or bled pressures to see that sufficient pressure head is available to extract the latent heat. For normal gas-works requirements, pressures of 15 to 25 lb. per sq. in. gauge appear to be ample, but many factors arise to influence profoundly the choice of the machine, and unless the works engineer be fully versed in thermodynamic theory and practice a specialist should be consulted

(i) Generation Costs

Under present-day circumstances, with costs varying from day to day, it is impossible to deduce an accurate and reliable figure for each method of generation previously mentioned, but in order to obtain a comparative statement, steam can be costed at approximately 3s. 6d. per 1,000 lb., only the energy component of the plant being taken into account.

In the case of small sets which discharge to atmosphere with an adiabatic drop of 140 B.Th.U. from 120 lb. per sq. in. (saturated) initial steam pressure, a theoretical steam consumption of approximately 25 lb. per kW is possible, which represents a charge of 1.05d. per kW; in actual practice, however, this figure is approximately double. With sets of 400 to 1,000 kW capacity discharging to condensers at 29 in. vacuum, it is usual to obtain average steam consumptions of about 20 to 26 lb. per kWh (due to low load factors) which gives a kWh. charge of approximately 0.965d.: if these sets can be operated at 80% load factor (as is possible with parallel operation), steam consumptions can be reduced to about 15 lb. per kW with a corresponding charge of approximately 0.63d. per kWh The back pressure unit shows a still further reduction, and, assuming a basic adiabatic drop of 10%, the cost per kWh is 0.21d. With increased load factor from parallel operation this figure can be reduced to about 0.18d. per kWh.

(iii) Rating of Engines and Turbines

It is only possible at best to generalize on the question of rating of steam engines on account of the varying load conditions that prevail for each drive; most important, however, is the desirability of running the engines at the designed economic rating, which is usually about 80% of the maximum loading. As load conditions vary from this figure the efficiency rapidly decreases, and with the diverse and numerous steam drives as exist on gas-works there is little wonder that steam consumption bears no relation to actual work done. By electrifying these small and scattered drives, and employing one large unit operating in parallel with public supply for the generation of electricity, it is possible to achieve complete control of the loading conditions, and thus run at maximum efficiency.

The rating of pass out and back pressure engines is very critical on account of the small adiabatic drop available for developing mechanical energy. Up to about 2,000 kW it can be taken that approximately one-third of the full-load steam consumption is necessary for light running, so that if the steam throughput on a 1,500 kW set is reduced to one-third of the full-load value the mechanical energy developed will be approximately zero, whereas if this reduced steam throughput is employed with a set of 500 kW rating the mechanical energy developed would be approximately 500 kW: therefore, if the steam throughput is at all variable for long periods, multiple units should be employed in preference to a single large unit.

(D) The Steam Source

(i) Fuel-fired Boilers

In the past, private boiler plant has been justified on the score of cheap fuel; to-day, fuel costs (with the exception of coke dust) are so high that it is impossible to generate steam, and thence electricity, at a price which could be considered favourable with public supply. Again, in this era of fuel shortage it is imperative that all fuel be utilized at maximum efficiency, which obviously precludes manually fired boilers so common on gas-works and which use valuable coke fuel.

Gas-works, however, invariably possess a liberal supply of coke dust, which has a limited market value, chiefly on account of the difficulty experienced in burning this fuel. Modern boiler plant employing mechanical chain-grate stokers and water-cooled walls is now available for this type of fuel and is without question the only installation which can be justified fully under present circumstances.

(ii) Waste-heat Boilers

It is very doubtful whether there is any other industry which offers such scope in waste-heat recovery as the Gas Industry; many works already raise steam at low pressures in this manner, but unfortunately it is allowed to fritter away on inefficient drives. There are approximately 1,000 undertakings in the country, with a potential waste-heat recovery value of about 2.65 million B.Th.U. per hour per million cu.ft. gas make per day, of which about 2.385 million B.Th.U. can be considered as returnable to the manufacturing process. The remaining 265,000 B.Th.U., if utilized in a proper manner, can produce about 70 kWh, which, with an estimated total gas make of 1,000 million cu.ft. per day, gives a total of 70,000 kWh. representing an annual fuel saving of approximately 385,000 tons.

To obtain this heat recovery it is essential to generate steam at about 350 lb. per sq. in., employing back pressure turbo-alternators operating in parallel with public supply and exhausting to works processes at about 15 to 25 lb. per sq. in. There is not the slightest difficulty in obtaining these conditions with modern plant, and the practice is in no way experimental.

(E) Gas-works Uses for Process Steam from Back Pressure Generating Sets

(i) Steam Requirements for Chemical Reactions

The major requirement for process steam comes under this heading and is mainly confined to the steaming of retorts, producers and water-gas plant. In every case, injection is by means of nozzles, and the criterion is weight of steam rather than its heat content; thus mass flow becomes of prime importance, and pressures should be related to this rather than to the general works steam system, with consequent throttling losses at the point of injection. Theoretically, pressures of 15 to 25 lb. per sq. in. give maximum mass flow, and in practice pressures of this order are quite satisfactory.

(ii) Process Steam for Heating Requirements

It is commonly believed that superheated steam is more useful, as a source of heat, than saturated steam: this is fundamentally incorrect, since steam when used as a working medium for heat energy depends almost entirely on the latent heat which can be obtained from a change of state. Thus, when deciding on back or bled pressures for such processes as benzole recovery, liquor concentration and water softening plants, superheat should only be provided to enable transmission losses to be maintained at a minimum, but care must be taken to see that sufficient pressure head is available to extract the latent heat. Maximum temperatures of the order of 250° F. are normally required, and steam pressures of 15 to 25 lb. per sq. in. (gauge) are quite suitable: if it be found that considerable quantities of process steam are used at different temperatures and, consequently, different pressures, it should be borne in mind that pass out turbines may have several bleeding points, although quite naturally the units become considerably more expensive.

(To be continued)

Croydon Co-Partnership

The Annual Meeting of Co-Partners of the Croydon Gas Company was held at the Civic Hall, Croydon, on June 9, with the usual large attendance of employees and their wives. Mr. William Cash, J.P., F.C.A. (Chairman of the Company), presided. Opening the meeting, Mr. Cash expressed his pleasure at seeing so many present and extended to them all a warm welcome. The Secretary of the Co-Partners' Representatives on the Co-Partnership and Works Joint Committee, Mr. J. L. Bates, then delivered his Report, describing the various matters dealt with by the Committee, such as applications for uniforms and permission to smoke in the offices, and the effect of nationalization upon the Co-Partnership Scheme.

Commenting upon the Report, Mr. Cash said that the bonus for the past year remained at 6% and amounted to £20,031—a substantial increase of £4,911 on the previous year. £13,027 had been used to meet the Pension, Widows' and Orphans' Fund contributions and the remainder stood to the credit of the Co-Partners' individual accounts. As for membership, at the end of March there were 852 Co-Partners and 279 Pensioners, including widows and orphans. On Mar. 21 of this year, the Directors re-opened the fund which had been closed to new entrants since 1941, and in order to avoid the loss of bonus and pension right resulting from the closed period, it was decided that the agreements granted to the 92 employees then recommended for admission to the scheme should have effect from one year after entry into the Company's service or April 29, 1941, whichever was the later. Where such an employee was employed full time with H.M. Forces or similar services, or was directed to other employment before that date, he should be granted Co-Partnership Service in addition equivalent to one half of the period from the date of entering such a service and April 29, 1941.

Savings had suffered a decrease during the year of £1,591, the total amount being £7,766. In connexion with the Hospital Scheme, £205 had been donated to six hospitals; to five of these, local hospitals, the Company had made similar donations.

Referring to nationalization, Mr. Cash reported that, as a result of a meeting called by the Co-Partners' representatives of the South Suburban Gas Company, a Committee had been set up of Co-Partners' representatives to consider the probable effect of nationalization upon Co-Partnership and Co-Partners in general. This Committee, upon which the Company had been represented, had been working in conjunction with the Industrial Co-Partnership Association and had arranged for a delegation, sponsored by the Association and led by its President, Viscount Cecil of Chelwood, to wait upon the Minister of Fuel and Power to make representations and to present to him suggested clauses for insertion in any legislation to deal with nationalization of the Industry. These clauses sought to provide that upon the transfer of the undertaking, no employee's conditions of service should be worsened; for compensation to those employees not taken over by the new authority; that the compensation payable to Co-Partner stockholders in respect of their holdings should not be less than the sum paid by them therefor, and for the provision of schemes governing relations between employees and management no less favourable to employees than the arrangements already in force. Mr. Cash added that there was an idea in the minds of certain people that nationalization was a good thing; perhaps they did not appreciate the fact that 52% of the shareholders of the Company held investments not exceeding £100.

To these people, many of whom were careful people who put their money into the Company, believing it to be well managed, it was of great importance to know that if nationalization came they would get a fair and square deal.

News from the Sports Club was good; the pavilion and ground had at last been relinquished from requisition by the R.A.F., and the Sectional Clubs had re-started with full programmes. Mr. Cash made particular reference to the newly-appointed Welfare and Sports Officer, Captain D. Pringle, whom he described as a fine athlete who had behind him much experience gained in the army.

Concluding his Report, Mr. Cash said there had been a 14% increase in gas supplied, achieving a record output. At the Annual General Meeting of shareholders a vote of thanks had been passed to all employees for their continued efforts and he had received many letters of congratulation upon the efficiency of the undertaking. He particularly wished to mention Mr. D. V. O'Meara, General Manager of the Croydon Gas Company, whose efforts had been untiring.

During the meeting Mr. Cash presented two fireside chairs and a cabinet gramophone to Mr. A. G. Jenner, who had completed 50 years' service with the Company, and also made long-service awards to the following Co-Partners who had completed 25 years' service: F. Atkins, W. T. Baker, R. E. Bathurst, C. R. Biggs, R. M. Chesson, B. A. Cook, W. J. Dudley, H. C. Hardy, F. Hayward, J. T. Hodges, C. Johnson, W. H. Jordan, J. R. King, W. W. Lawrence, S. H. McDonald, F. C. Pierce, G. Poole, A. F. Putland, J. H. Ring, C. W. Strudwick, G. B. Vanderwerff, and H. L. Woolgar.

The Co-Partners, who with their wives numbered over 800, were afterwards entertained to a variety performance.

Education, Recruitment, and Training of Gas Engineers

Discussion on Professor Stacey G. Ward's Institution Paper

FOLLOWING is a report of the discussion on the Paper on "Education, Recruitment, and Training of Gas Engineers" (Communication No. 317) presented by Professor Stacey G. Ward at the Annual Meeting of the Institution of Gas Engineers on June 5. A summary of the Paper was published in the "JOURNAL" of June 18 (pp. 681-683). In the absence of the Author the Paper was presented by Dr. Green.

Mr. C. F. W. Rendle, O.B.E. (Redditch): Many and various are the paths along which in the past young men have progressed in pursuit of eminence and success in the Gas Industry, and some of the most outstanding careers have been built up on an educational foundation which through lack of opportunity, resources, or facilities, suffers by comparison with that available to young men of to-day. The opening statement in Part 2 of Professor Ward's Paper may in consequence appear rather too categoric to be immediately palatable to everyone. It is so much in consonance, however, with the highest ideals of those who aim at social and cultural progress, and so fundamentally sound in principle, that it behoves us to regard it with broad minds unfettered by prejudice and free from the restrictive influence of personal regrets engendered maybe by one's own limited facilities.

At the outset of our consideration of this wide subject we realize its great importance because we are reviewing the mode of education best suited for those who will assume the technical, managerial, and commercial control of our Industry in the future, and in whose ability is vested the great potential developments of which our Industry is capable.

Professor Ward's thesis is education first and vocation second, and he wisely draws our attention to the essential difference between education and vocational training, as indeed did Dr. Braunholtz in like manner in his excellent Address to the Manchester Juniors recently. Few will disagree with that contention, and no one, I am sure, will cavil at the inestimable value of the educational backcloth on which a young man should weave his technical attainments. It is recognized of course that the Education Committee of the Institution has constantly had it well in mind.

The Critical Period

As in all ideological changes, however, it is the transitional period between the old order and the new which is the most critical. If we accept, for example, that recruits for advancement to our executive posts are to be University graduates it is obvious that for some time young men for these positions will also be drawn from other sources. The immediate value to their employers of these young men from other sources will for a year or two be measurably greater than that of the University graduates—lacking as they are in vocational training, professional qualifications, and practical experience. The ultimate value of the two types is not in question. However greatly we appreciate, therefore, as I do, the unqualified value of a University life for imparting culture and developing personality, we must not assume that this is the sole means of its attainment. It is in this transition period therefore, if not in a lesser degree at all times, that tolerance and prudent judgment is demanded both from the colleagues of different origin and from the employer. It is hoped that those into whose hands the ownership of the Gas Industry may pass will not be lacking in the exercise of these qualities, nor so immured in the execution of stereotyped procedure as to be devoid of an appreciation of the humanities.

Dr. Ward expresses the opinion that few boys at school know what they want to do in life but that at Higher School Certificate age they have at least made a choice between pure and applied science. My experience would not lead me to be so definite, and I believe moreover that if at that age a boy does make a choice it may readily be in favour of a career for which he is not best equipped mentally, physically, or by temperament. This opens up a consideration of the effects of educational legislation which may result in the segregation of boys at an early age for tuition in grammar schools or their type on the one hand and technical schools on the other. Potentially fine types may be found for development from each class of boy on whom judgment has thus been passed so early in life, and we must avoid any tendency to prejudice in appraising the qualities of the eventual product as a University graduate from either source. We assess the academic quality of a recruit to Industry by his certificates of proficiency and his University degrees, but how do we recognize and assess his education?

Importance of Interviews

Here if I may be permitted again to quote Dr. Braunholtz, we recognize that education implies the possession of certain attributes, but how are we to assess them, for example, at a brief interview? And yet how many good men are turned down after a short interview because of some unjustified reaction of the interviewer, or because some praiseworthy but irrelevant trait of the candidate hides his true value from the unskilled eye of the employer. A successful interviewer must possess the qualities of shrewd alert observer, a psychologist, and an impartial judge. How many of us fill that bill sufficiently? I hope therefore that in this connexion the utmost assistance to future employers will be readily forthcoming from University staffs in indication of a candidate's educational attributes, and in such a human and personal manner as to be most helpful.

Professor Ward has told us of the vacational employment of University students at industrial works and of the value of such training, but has said nothing of what the Professors do during the long vacation. With all the deference due to members of that distinguished fraternity, may I suggest that mutual benefit might accrue from a close and regular contact between the University staff and the industries served by the products of their teaching. I can imagine that otherwise it must be a very easy and natural for a Professor to plough for himself a furrow of the same cross section throughout the gamut of its whole course, regardless of any changes in the terrain or altered demands of the crop. Fortunately I know that Professor Ward is not opposed to this close liaison between University and industry.

Collaboration Committee

You may be interested to know that here in the Midlands Mr. T. F. E. Rhead, whose work as an ardent educationist is held in such high esteem, has formed a Committee of Collaboration between the Department of Chemical Engineering in the University of Birmingham and the Gas and Allied Industries.

Dr. Ward, who is a member, has expressed the hope that it may eventually form the nucleus of a Consultative Committee collaborating with the University to the mutual advantage of both bodies, and this is without question a movement in the right direction. With the eight points in which Dr. Ward summarizes his conclusions we shall find no fault. Numbers 1, 2, 3, 5, and 6 are wholly desirable and well within the compass of every reputable employer. No. 7 finds equally sympathetic agreement but is beyond our ability as professional engineers as distinct from employers to assure him of compliance. No. 4 is desirable but difficult of accomplishment because of the further tax it would impose by provision of additional teaching staffs drawn from the ranks of Industry. No. 8 is clearly a matter for the elder Statesmen of the Institution, but is, I think, entirely in consonance with the principles underlying their former decisions.

Finally, in appreciating the topical interest engendered by Professor Ward's Paper may I hope that his desire may be realized in the usefulness of the discussion.

Chemical Engineers' Syllabus

Mr. E. A. Goodland (Deputy Manager, Birmingham Gas Department): One of the chief reasons why I have pleasure in contributing to the discussion on this Paper is that I belong to that relatively small proportion of people in the Gas Industry who have actually been trained as chemical engineers. Therefore I cannot help thinking that a training in chemical engineering should be valuable both to the individual who possesses it and to the Industry as a whole. In addition to my own opinion on this subject there are very solid reasons for that belief. I think if you were to refer to the syllabus of the Degree Course in Chemical Engineering published by the Institution of Chemical Engineers you would see that it indicates a very good foundation for the training of one whose career lies in the Gas Industry. Apart from fundamental subjects—mathematics, physics, and chemistry—the syllabus goes on to such subjects as these:

Strength of materials.
Theory of structures.
Surveying.
Fluid flow.
Heat engines.
Mechanism.
Electrical technology.
Metallurgy.
Fuels and combustion.
Transport and storage of materials.
Heat transmission.
Materials of construction.
Factory layout.
Organization and management.
Plant design and drawing office practice.
Report writing.
Works visits.
Vacational experience. And last but not least
Unit chemical engineering operations.

No gas engineer can be without acquaintance with every one of these subjects. Comparing this syllabus with those of the chief Gas Engineering Courses it appears to me that while the chemical engineer devotes his time to consideration of the basic principles underlying all these subjects with occasional illustrative reference to specific types of plant or process, the Gas Engineering syllabus is by contrast

devoted to the consideration of existing practice, types of machine and plant in common use, the properties of coal gas in particular rather than gases in general, with reference to the underlying theory thrown in at appropriate places. Thus it may well be that the Gas Engineering course would turn out a man who could more quickly find his way round a gas-works and identify the items of plant and know the conditions under which they can best work; but because his studies have been based more on existing practice than underlying principles, he is probably not so ready to receive and conceive fresh ideas and new developments. On the other hand the chemical engineer may not readily appreciate the importance of proved reliability and performance to a public utility undertaking.

The Mental Impact

Granted that the chemical engineer is worth starting, and I think most of us would agree that this is so, may we follow the career of the young graduate and study the impact of the works on his mind. I should like to illustrate the phases of this impact by reference to a chart which is indelibly imprinted on every chemical engineer's mind in very early days, and should be within the recollection of most gas engineers, namely, Stanton's Curves showing the relation between the friction factor $\frac{R}{\rho v^2}$ and the Reynolds criterion $\frac{\rho v d}{\eta}$.

Let us apply Reynolds criterion to the student entering college—his friction factor pretty high and his value to the Industry pretty low. He pursues a calm streamlined flow according to a fairly simple formula untroubled by the roughness of his surroundings, unhindered by bends and elbows, and his friction factor decreases as his value by our criterion increases. Sooner or later he must in most cases make the plunge and leave the streamlined flow of the University for the turbulence of life in industry. He passes into that region of critical behaviour in which performance cannot be accurately predicted. This is the testing time to which Professor Ward refers and to which I wish to return.

In time, depending now on the conditions of his surroundings in addition to his own inherent factors, he gains the region of turbulent progress, and although his friction factor as a junior member of the staff is higher than it was as a senior undergraduate at the University his criterion is much higher. Fresh factors make themselves felt in a less simple way but he can maintain steady progress as he settles down and finds the course most suitable to him and his employers. His friction factor decreases below what it ever was before and his criterion increases with advancing years of experience. During this critical period, as he is adapting himself from the University outlook to the industrial outlook, he is probably amazed at the blithe disregard his elder colleagues show for many of the cardinal rules he has learned. He finds his boss knows nothing and cares less about the Prundtl-Taylor theorem and the Grashof number. He finds that the designer picks many items of plant from a catalogue instead of working out dimensions with a slide rule and text book, and he may be generally shaken to find the rule of thumb attitude prevailing among many of the plant manufacturers whom he had thought must be enthroned on the summit of chemical engineering skill. If he can survive this initial disappointment he may try and figure out the reasons for the departure in practice from what his often elementary theory would lead him to predict. He may identify some of the many factors which he must observe to exist but which cannot be represented adequately by a letter in a formula. It is to be hoped that he will make careful note of the reasons he can find for departure from what he would consider correct practice, and if he cannot find the reasons himself he should enquire and enquire again until he finds them, and it is here that his superior officers have their chief duty to perform in his education.

A Cardinal Rule

I should put it as a cardinal rule that if a young chemical engineer asks intelligent questions he is absolutely entitled to truthful answers whether or not they are critical of whoever put the plant in. Sometimes there is no good reason and he should follow that up and see if he can provide the answer himself. If he can detect an underlying flaw in the design or point out how a correct application of principle can be made with advantage, he is beginning to earn his money and his reputation. If he cannot, well, he has not benefited much by his expensive education, but my experience is that all too often he is not given an honest answer—that such a thing is so because it was easier that way or because we have always had things that way, or because to alter it means a major disruption of production, or because the boss likes it that way but as soon as he retires it will be altered, or because we happened to have it in stock, or because we did not know better at the time, or better still there is no reason at all, we will alter it next shut down.

But the beginner must do some of the work himself and not just present a string of easy ones, the answers to which he could possibly reasonably find for himself. It is not easy to keep the recently joined graduate busy all the time with work of the right calibre. I would suggest what I have found myself to be of the greatest value—always to have a particular almost insoluble question to be investigated in odd times when routine duties are slack, examples of such which have kept me busy and have led to a tremendous amount of incidental experience and interest have been at various times such things as—Why was the CO/CO_2 ratio of gas after the detarrer different from another stream of the same gas after a washer up? What was the complete heat and materials balance of the semi-direct ammonium sulphate plant? Why did No. 1 furnace ease up when the completely independent No. 2 was taken off blast? These things can always be reflected on, measurements made, references looked up, laboratory experiments performed depending on inspiration, mood, and circumstance.

One may be lucky enough to find the answers in one or two cases and gain considerable credit thereby, but the embryo chemical engineer who relaxes and fills in his pool forms or reads novels in slack periods is doomed. It goes without saying that a sympathetic chief works wonders, but these things can be performed even with an apathetic or hostile superior and are, in fact, even more necessary in those cases.

The Livesey Chair

Mr. H. J. Hodsman (Hon. Member): The subjects of Professor Stacey Ward's Paper are important and timely. The Gas Industry itself has spent about 25 years working an education scheme. At the moment technical training is a widespread source of discussion. Conditions are fluid and the times are favourable to review what has been done in past experience and to come to decisions about future opportunities. I do not propose to discuss the Paper in detail beyond endorsing Professor Ward's remarks in general. Least of all should one decry the part-time training with which past generations of gas engineers have been forced to be content themselves. My long contact with members of Gas Associations has compelled me to respect them. The fact, however, is that at some stage in education professional training becomes a full time job. This was recognized by those who are responsible in the Gas Industry nearly 40 years ago when the Livesey Professorship was endowed at the University of Leeds. The wisdom of that step can be judged by the large number of graduate who since that time have entered, and attained prominence in, the Gas Industry, and for whom the demand was never so active as now.

Professor Ward quite rightly emphasizes the chemical engineering approach to the subject of gas engineering. One should not, however, overlook the fact that the course for gas engineering established in 1910 by Professor W. A. Bone at Leeds was in effect a course in chemical engineering—a name which at that time was not yet current Many years elapsed before the name "Chemical Engineering" acquired its present significance in this country. Actually the manufacture of gas is a process of such breadth and depth of physical, chemical, and engineering principles as to provide a full exercise in chemical engineering if made by the right approach. In the University course there never was "too great an insistence on the practical details of any one industry"—to use the misguided words in the Heyworth Report. However, with the recent additions of more general equipment during Professor Townend's tenure of the Livesey Professorship this approach is emphasized.

Turning to the subject of recruitment, present conditions are without precedent, as is often shown by the experience of enquirers seeking young men as though they could be supplied ready made of the highest calibre and on demand. This may have been, by chance, possible in the days when the call for young graduates was small and the opportunities for study limited. As Professor Ward remarked, it is unusual for boys to embark on higher school education with any predetermined career in view, except by a few influenced by personal circumstances. Most boys, especially those who have to rely on their own efforts, formerly had to follow the most promising path which they found. The ablest boys might expect to be trained by the schoolmasters for the open University Scholarships. They would then enter the avenues which were supposed to lead to the higher Civil Service or the more remunerative professions. These were not known to include gas engineering. It is not surprising that when in wartime the need arose there was no such from school boys to take up such an unfamiliar study.

State Bursars

Nevertheless the need for trained technologists became clamant and led to the institution of "State Bursars" whereby boys and girls with an aptitude for physical sciences could be put quickly through the Universities and into technical services of the State. Incidentally the need for gas engineers and fuel technologists was at first unrecognized. Bursaries were at first granted only for physicists, engineers, and metallurgists, but later this omission was rectified.

The lesson of these events was that in recent years even the State could not rely on getting an adequate recruitment of trained technicians of University status by voluntary action. It was compelled to create some new influence to cause trained ability to flow into certain kinds of technical employment. Now it is noticeable that large industrial corporations are taking similar action, even some in the Gas Industry; the United Kingdom Gas Corporation, for example. If the technical recruitment under present conditions is now considered, the question arises whether the Gas Industry can in future be sure of securing its needs without directive action. Is it already making the best use of its own influence? For instance, its own education scheme enables it to examine annually a large number of its young men, many of whom must be endowed with talents justifying the opportunity of full-time study and would value the incentive to use it. Experience shows that

apprenticeship in the Gas Industry, combined with a University degree, is a valuable qualification both to the young man and to his employer, whether within or outside the Gas Industry. It does not seem to be adequately recognized and applied.

To-day nationalization may lie ahead. No one knows how it will operate. Will there be a considerable recruitment of State bursars passing through the Universities? If this is to happen there should be an equivalent path provided in advance for the boy who enters the Industry from school.

Mr. **T. F. E. Rhead** (Chief Chemist, Birmingham Gas Department): May I first of all congratulate the President on carrying on and strengthening the liaison work with the Birmingham University. I would refer firstly to the very fine time we had at the Reception and Dance at the University on Tuesday evening, and secondly to the wisdom of the President in inviting Professor Ward, a very old friend of ours, to read this valuable contribution on education. I should also like to congratulate Dr. Green on the able way in which he presented the Paper. May I congratulate Professor Ward on a concise and excellent contribution to our literature on education.

The University's True Sphere

I will try not to be too provocative, but I wish to make a few comments concerning the respective spheres of Universities and Technical Colleges in the educational world, and also on the kind of men we require in the Gas Industry. Universities and Technical Colleges are essentially complementary to one another in their services to the community. In the one we wisely plan to produce leaders by teaching and researching at the highest level in the several departments of learning which go to constitute a University combined with the character-forming corporate life which is so uniquely possible therein and which should produce men and women with great ideals of service to the community. In the other we plan chiefly to produce the large number of technicians required to follow such leadership by imparting the skill and knowledge of the arts and crafts of industry, and although the corporate life is much more restricted on a one-faculty organization much can be done by inspired teachers who will usually have had the advantages of University training.

Between the planned teaching and researching in fundamentals at the University and the planned teaching of vocational subjects at the Technical Colleges there cannot be a very clearly defined boundary, and it would be unwise to attempt such in too rigid a manner. Nevertheless it distracts from the University's true sphere of work if the University enters the realms of vocational teaching unduly. For this reason I feel that the University of Birmingham made a truly forward move when it decided to sublimate its more vocational departments of Oil Engineering and Coal Utilization into a Department of Chemical Engineering.

On the one hand it is not wise for a University to teach and research at any more vocational level than that of the applied sciences of, say, medicine, metallurgy, chemical engineering, electrical engineering, civil engineering, mechanical engineering, and industrial administration. On the other hand wise industrialists will not wish to deflect the Universities from their true service to the community by attempting to hitch the teaching of their particular callings to the University chariot just for commercial and prestige advantages. It would be a disservice to the community—that is, ourselves—if the Universities became super technical colleges. It confuses their sphere of influence and is very unfair to the vitally important Technical Colleges themselves.

"You are Very Biased"

As regards our own Industry to which I have been proud to belong for a great many years, we find mechanical and civil engineering—from the very manner in which the evolution of the Industry has taken place—very strongly entrenched and very reluctant to give proper play to the qualified chemical engineer. Yes, gentlemen of this great Industry—many of my best friends—you are very biased and it is injuring future possibilities of taking our proper place in the vast outside chemical world. Chemical engineering is one of the greatest of the applied sciences and to place the qualified chemical engineer under the mechanical or the civil engineer is very short-sighted to say the least. As I suggested to the Midland Association of Gas Engineers and Managers three years ago, the chemical engineer and the mechanical or civil engineer should be at least co-equal under the management. This is happening on the contracting side, and largely accounts for the better technical staffs of the latter as compared with the gas-works in general.

A well trained chemical engineering graduate will soon pick up the vocational side of gas engineering, which is at least 70 to 80% chemical engineering, and moreover a sensible student will quickly realize that he has a far better and wider horizon of jobs waiting for him as a chemical engineering graduate than as a more vocational gas engineer. This will seriously affect our recruitment, as Professor Ward so ably remarks in his valuable Paper.

Mr. **Franklin** (Whessoe, Ltd.): Professor Ward's Paper as presented through Dr. Green has provided us with a most interesting study of the education and training of gas engineers from what may be termed the "producers'" point of view—the Universities' viewpoint. I should like to say a little from the "consumer's" angle, as representing those people who employ these chemical engineers. I am particularly interested in the subject as I am, at least I call myself, a chemical engineer. I run the technical department of a firm of gas contractors, and we do find it absolutely essential to staff such departments with chemical engineering graduates, and accordingly we have an ample annual intake of University graduates. I would like to draw the attention of the Institution to the careers that are offered on the contracting side of the Gas Industry. I have had some personal experience on both sides, and I think I can say—and mention has been made of it by previous speakers—that when these men are not fully occupied they should have problems set for them. If they come into the contracting side I can assure you that they will have problems in store for months and months ahead. Personally I am always about six months behind in the problems I have to tackle. They will get plenty of experience and have unlimited scope for their initiative. This subject of chemical engineering in the contracting side of the Gas Industry is dealt with admirably in the Institution publication on "Careers in the Gas Industry." I do suggest if they join the contracting side of the Industry they will get such experience as they will seldom get on the other side of the Industry outside of the largest gas undertakings. It is of more interest to design a new plant and then to start it up—at least I think so—than to take it over as a going concern, and I think that is a great advantage and further it provides more stimulus for the young graduate. It is also a very good method of training such graduates for appointments in the Industry, and I think many gas engineers would bear me out in saying that men from the contracting side are often very useful members of their staffs.

Value of Chemical Engineering Training

The system we adopt is to arrange for the Company's technical department to calculate the basic design of the intended plant process and hand over the design data to the draughtsmen to turn our roughly sketched data into engineering drawings. The technical man is almost invariably a University graduate, and he follows the job through, and eventually puts it to work when the construction is completed. There are a lot of other jobs, such as plant performance investigations, technical sales work, and publicity work, and these are all very interesting for the bright young man. My experience definitely is that the chemical engineering courses, either graduate or post-gradute courses, do provide the best training for the man who is going to be employed on the contracting side of the Gas Industry. The value of the chemical engineering training, I would suggest, is three-fold. In the first place it does train a man in the fundamental principles of the design of the plant which he is going to handle. In the second place, and no less important, I do think that this kind of training offers a reasoned approach to any problem, whether truly technical, or, in business administration, non-technical. My Company often say to me: "Get one of your bright young boys to do this or that"—something quite divorced from engineering—and I find that because of their training they have a more reasoned approach to their problems than those without a University training. In the third place, the fact that a man has an honours degree in chemical engineering does not necessarily mean that he is a perfect man, but he is no less valuable because he has his degree. He has, in fact, a much better chance of making a sound contribution to a variety of problems if he has taken a more specialized degree course than one with only a general chemical engineering one.

Mr. **H. R. Hems** (Industrial Department, Birmingham Gas Department): Professor Ward paid me the honour of asking me to take part in this discussion, and I am very delighted to do so, although I feel that his absence is regrettable. I find myself so much in agreement with the Paper that it is very difficult for me to make any comment, and in that case I shall have to make any comment provocative. Professor Ward in his excellent Paper has made no direct comment on the details of the Education Scheme of the Industry, either as operated in the past or projected. In most of his comments he refers particularly to those who will enter the Industry with a University degree. Most of us will agree on the desirability of the standards of further education and training of such men and, therefore, the Paper is difficult to criticize. Some of us may have misgivings as to whether they can be adopted.

Human Nature Tells

In the first paragraph I find myself with some slight doubts when Professor Ward states that "it is upon University graduates that the Industry must in future depend for its leaders and for manning the higher technical posts." The latter certainly, and when that desirable state has been reached of equal opportunity for all I would also agree to leaders, although I feel that until many of the suggestions contained in the Paper have leavened their way even through the University itself, this Industry, or any other for that matter, may have to take the fullest advantage of men who have the attributes of leadership superimposed on, perhaps, what the Professor would consider an incompletely scientific training, and an advanced practical training.

While I have sometimes felt that a University training produces the individualist worker, human nature being what it is I think the leader will emerge with or without the valuable University or after-University training to which the Paper refers, periodically more forcibly without. I like Professor Ward's reference to the boy and the stages of his decisions with regard to what he wants to do—the

boy whose natural attributes are early directed into the right channels for his future career is very fortunate. His tribute to the foresight, hard work, grit, and determination of the men who have entered the Industry straight from school, &c., is appreciated from so high an authority as Professor Ward. I can endorse that many of them would have welcomed the University approach, speaking from an entirely personal point of view, since I realized years ago its value to the Industry and nationally, and the great importance of the industrial work of the Industry with which I have been so closely associated, I have regretted not having that University approach.

My interest in the Industry's education scheme has been idealistic by a desire to give the right guidance to entrants to the Industry. Our District Education Committees have done most valuable work in the past in this direction. On the conclusions to which the Professor comes—I think these might have been headed "A Charter for University Students entering the Gas Industry"—and on item No. 6 reference is made to the sympathetic human nature which may be achieved without "coddling." I rather think some of us may feel that these conclusions do suggest a certain amount of coddling or excessive "carrying." After all, those to whom the Professor paid tribute in the early part of his Paper had a job of work to do by day, generally under the eye of the Victorian, Edwardian, or Georgian task master above them, and had to obtain all the additions which he advises in their own time, and I am afraid he is asking a great deal from busy executives and even from chief assistants who are the men to provide the additional training, to see that these desiderata are carried out. One does expect the University course, particularly under the advanced plans suggested by the Professor, to provide staff well along the course of training usually necessary. The job of work to which I referred still has to be done, and I pay tribute to the man who, either with or without University training, completes his qualifications either to the membership of the Institution of Gas Engineers or any other Engineering Institution, or obtains a University degree by his own study.

Are All Your Windows Really Necessary?

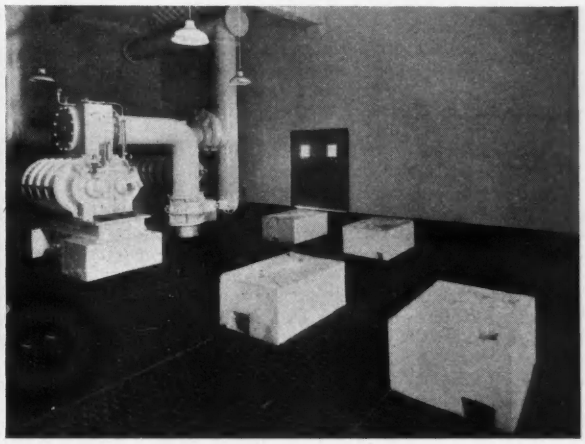
(A Communication from the Liverpool Gas Company)

Consider the time, material, and labour involved in providing windows in gas-works buildings, and look around many gas-works and count those that are broken, completely covered by grit and smoke, placed alongside later structures, or even covered by plant or machinery subsequently installed.

Take a look at a set of quantities for provision and insertion of metal windows in a brick wall and you will find it an expensive schedule calling for at least eight tradesmen at a time when skilled personnel is at a premium, and material and wages at a high level. And all this to establish a perpetual cost in the shape of maintenance. The claim that the architect can make a gas-works beautiful by providing windows is questionable, and if the architect were to give an opinion he would undoubtedly agree that he could produce a quite pleasing elevation without resorting to the use of inefficient window space.

But apart from the design, and particular siting, the work and expense involved in maintenance of windows lead to serious consideration of the economics of the case.

External view of Garston meter house showing bricked-up windows



Interior view of the meter house after the windows had been bricked-up

Ventilation

The fact is that the provision of windows in a gas-works does not achieve any high standard of efficiency or economy in either lighting or ventilation. Windows are responsible for large heat losses and draughts, and in this country of badly ventilated and badly heated buildings the subject becomes still more important. Heating systems in general tend to be inefficient, due to the number of approximations which have to be made in the original calculations to allow for heat losses by and through windows. It is fairly obvious then that if efficient heating and ventilation is the target, windows would best be eliminated except where vitally necessary.

Windows, then, are evidently not necessary for adequate ventilation, but they may be in certain circumstances to give light. These cases are really few on a gas-works and far more accurate work can be carried out with scientifically designed artificial lighting than with light which fluctuates according to the whims of the sun or the window cleaner.

Here are a few points to consider:

1. Windows situated near coal and coke plants are perpetually dirty unless there is a frequent window cleaning routine.
2. The number of windows painted according to schedule, either for preservation or for appearance, and where improvement of appearance is of short duration, is a maintenance cost which may be excluded.
3. Coke grit, sulphur, and moisture on both wooden and steel window frames causes corrosion and deterioration.
4. Ventilator windows which can never be used because of a dusty atmosphere are an expense. Probably the hinges in the ventilator will rust so that such windows will normally be unopenable.
5. Windows in retort houses are generally useless.
6. Certain buildings are used casually, such as meter houses and calorimeter rooms. Here the windows are being continuously cleaned and maintained, but there is little valid argument in favour of window lighting or ventilation.
7. Glass windows frequently become discoloured as the result of unavoidable discharge of effluent and oily vapours, their effectiveness being rendered practically negative.
8. Very often continuous artificial lighting is necessary to maintain working conditions in rooms already "lighted" by windows.
9. Window cleaning often calls for expenditure on platforms, ladders, and special access facilities.
10. Windows invariably dictate the position of plant or furniture, and personnel are often condemned to sit in draughty positions because of this restriction of flexibility in the placing of benches, desks, plant, cupboards, &c.
11. Gasmaking is a 24 hour process, so the windows are useless for many hours anyway.

Main Advantages. (*a*) Reduced heat losses; (*b*) improved ventilation without draughts; (*c*) reduced maintenance; (*d*) reduced motive for distraction; (*e*) better use of wall space; (*f*) facilitation of estimating for heating and ventilating schemes.

Disadvantages. (*a*) Exclusion of direct sunlight and natural light; (*b*) possibility of mechanical failure of heating and ventilating systems; (*c*) possible increase in the cost of artificial lighting (which is probably negligible in most gas-works); (*d*) cost of air conditioning, if necessary.

Liverpool is proceeding with a policy of bricking up unnecessary windows and where new buildings are erected windows will be eliminated, with considerable economy as a result.

Mechanism of Carbonization in Continuous Vertical Retorts*

The Bow Common Experiment 1945/46

By F. R. WESTON, Ph.D., D.I.C., F.R.I.C.

(Gas Light and Coke Company)

(*Continued from p. 570*)

THIS effect will detract from the smooth travel of the charge as discussed later, and moreover the pocket of coal from 23 ft. downwards is not likely to be completely carbonized before reaching the extractor. Consequently, the discharge will become "green" or "smelly" and the extractor man will slow up the rate of extraction. Actually, of course, the end of the main core is well up in the retort and the throughput does not require decreasing.

The tallies that were inserted through the centre rodding hole appear to have travelled in a most erratic manner as regards their vertical distribution. Many of them have been held up, but it is significant that with the exception of Nos. 5 and 6 whose behaviour we have already explained, none of them was *further down* the retort than they should be as indicated by the average rate of travel line shown on the graph. This erratic behaviour is considered to be entirely due to an "entry effect" right at the top of the retort. Tallies 11 and 12 were found still on the coal charge at the top, and it seems that owing to the auxiliary coal hopper being offset from the retort and the sloping base being set at rather a shallow angle, it is possible for coal to run to the front of the retort where it forms a ledge and may stay there for several hours. Consequently, it cannot be said that each tally started its journey as soon as it was inserted, and their vertical distribution does not represent the true travel of the coal core. The volatile matter, abrasion index and apparent bulk density figures for the coke samples taken from the front and back of the major axis centre, all indicate even and continuous travel.

Retort No. 29

In this case the non-off-take side travelled more regularly, as shown by the distribution of tallies and the coke analyses. Tallies 4 and 5 were exceptions, but these were found embedded in pitchy deposits right at the top of the retort. From 19 ft. 6 in. down to 23 ft., there was a void at the back of the retort, clearly seen in the 21 ft. photograph of Fig. 10. The whole of the coke at this level from the centre of the retort to the non-off-take end was of a soft, spongy nature, and this is shown by its low apparent bulk density compared with its low volatile matter. It would seem that this coke had been formed under conditions of no compressive load and rapid carbonization.

On the off-take side travel was very irregular. There were no large voids as in Retort No. 27, but there had been more movement of the coal in a horizontal plane. The coal core at the top of the retort thinned rapidly across the minor axis, but continued to occupy most of the length of the major axis until at about 8 ft. 6 in. it began to contract rapidly and had almost disappeared by 10 ft. 6 in. Here it split into two separate portions, and at 14 to 15 ft. there had been a big hold-up as shown by the close proximity to one another of Tallies 7 to 10. Below this at 17 ft. the coal core expanded again and reached to within 9 in. of the off-take end wall. Most of this coal had evidently travelled over from the centre core since Tallies 4 to 8 (Δ), which had been inserted at the centre rodding hole, were all found in this coal pocket near the end wall. The core on this side extended down to nearly 24 ft., but the coke below this seemed to have travelled normally through the retort as the tallies at the bottom were spaced level across the retort. These movements are confirmed by the analyses of coke samples taken from the off-take side where the minimum volatile matter is at 14 ft., just above the hold-up, and the volatile matter increases in the coke below this level.

The centre tallies, apart from their wandering to one side, also showed the same "entry effect" as in Retort No. 27. Tally No. 11 is interesting in this respect. It broke into halves when being inserted; one half remained on the coal just inside the retort, together with the succeeding Tallies 12 and 13, but the other half had travelled normally and was found 9 ft. down. The samples taken from the back and front of the centre of the charge show a regular decrease in volatile matter with the exception of that taken at 14 ft.

Now a void was present in the middle of the charge as shown diagrammatically in Fig. 15. This void led from the edge of the left-hand part of the core towards the middle of the major axis, and it is probable that the coke and semi-coke at the 14 ft. level had been formed, in part, from coal that had slipped through this void, and so having an abnormally high volatile matter. The core on the left-hand side went down to 24 ft., as has been mentioned, and from the cross-section at 21 ft. (Fig. 10) it is seen that it has caused the charge to fill the whole of this end of the retort.

The Multi-Metal Tallies

These were dropped into the retorts through the rodding holes one quarter way along the major axis—in Retort No. 27 towards the off-take end and in Retort No. 29 towards the non-off-take end. In both cases they fell down beside a division plate and so rolled over the coal surface towards the end of the retort. They nearly all travelled vertically downwards and were mostly found within 6 in. of the end wall. The percentage recovered, however, was lower than for the brick tallies, it being much harder to distinguish them in the coke, particularly when several of the metals had melted. The temperature indications given by these tallies therefore only apply to the outer layers of coke near the end of the major axis.

All the tallies found had exceeded 420° C. and that the temperatures increased steadily from 400° to 500° C. at 9 ft. down to 1,080° C. or above at 25 ft. down; the temperature was still increasing from 21 ft. to 25 ft.

Structure of the Charges

Although the position of the tallies and the sample analyses both show that there has been much relative movement of different parts of the charge as it travels down the retort, the general nature of the charge indicates that this movement only occurs in the coal core, the outer layers of hard coke travelling as a single monolith. Examination of the photographs of the charges in Figs. 6 and 10 shows that as soon as the first outer skin of coke is formed (and this happens almost immediately the coal enters the retort proper) vertical cracks at right angles to the major axis walls begin to develop. As the charge travels downwards and the coke skin becomes thicker, these cracks extend inwards in just the same way as happened at Nine Elms.

In the Bow Common retorts we have already seen that the major axis dimension increased considerably down to 11 ft. and so there is room for these cracks to form. It is a matter for speculation, however, as to whether such cracks could develop to any extent in this part of the retort when the installation was new and the major axis was of constant length.

The photographs show that these vertical fissures extend downwards in roughly continuous lines, and there is no suggestion of relative movement of these outer layers of coke. Except in very abnormal cases, where the whole charge breaks away leaving a void right across the retort, it would seem that voids at the ends of the retorts must have been formed at the top and travel downwards at the same rate as the outer coke monolith.

By 10 ft. down, the minor axis had widened considerably and the coke first formed at the ends of the retort does not conform to the new retort shape. It can either remain as first formed, so leaving spaces in the corners, or it can split down the centre leaving a V-shaped block of coke at each end. Examples of both types of behaviour can be seen in the "plan" photographs. When these end spaces have formed there is now room for the vertical surface fissures to develop even if the major axis length remains constant.

It is noticeable, however, that these vertical fissures are narrower in the lower part of the retort as though they have been squeezed together by the smaller major axis dimension at these lower levels, the individual blocks of coke pivoting about the plastic layer.

Although the surface of the charge shows very little evidence of horizontal cracks developing towards the bottom of the retort, where the outer layers of coke reach a temperature of 900° to 1,000° C. and thermal after-contraction can take place, it was found that the coke was noticeably harder from 18 ft. downwards and tended to break up into lumps when removed. This tendency to break into

* Paper to the Southern Association of Gas Engineers and Managers, May 20.

roughly cubical shapes would be helped by the lateral compression envisaged above.

At 23 ft. 6 in. in Retort No. 27 the charge had split apart completely along its centre. This did not happen in Retort No. 29 where carbonization was not so complete. In just the same way as was found in the coke charges of the retorts at Nine Elms, the coke first formed remained as a separate skin which could be peeled away

FIG. 16

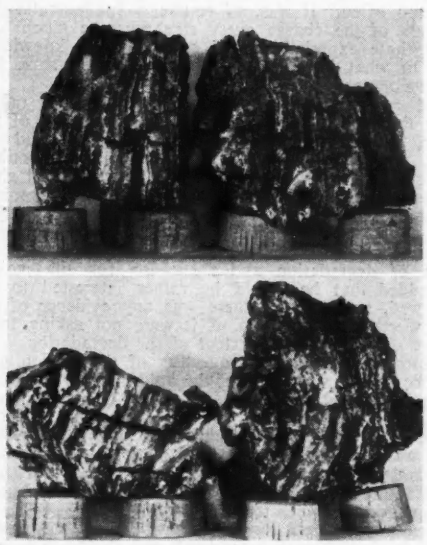
FIG. 17

from the main block of coke even to 20 ft. down the retort. It was lighter than the rest of the coke. It is this coke that will be most easily abraded into breeze on its passage through the extractor.

Coke Structure

During the retort dismantling several large blocks of coke were removed, their exact position and orientation in the charge being carefully noted. These pieces of coke were subsequently treated by the technique originally described by T. F. E. Rhead in *Proc. I.G.E.*, 1925-6, p. 285.

In our case this consisted of partial combustion by placing the coke lumps in a scurfing horizontal retort for periods from ½ to 1½ hours, and photographs of two pieces after such treatment are shown in Figs. 16 and 17 (from Retorts 27 and 29 respectively). A well defined periodic layer structure is revealed, the bands that can be seen being due partly to layers of differently-coloured ash and partly to the coke substance itself being affected to different degrees by the oxidation. The bands run parallel to the heating surface of the retorts and



FIGS. 18 (*below*) *and* 19 (*top*)

represent the advance of the plastic layer, and, in fact, this structure can sometimes be seen in pieces of coke taken straight from the retort without any chemical "etching."

Figs. 18 and 19 show cokes collected from working vertical retorts and treated in the same way, Fig. 18 being coke from the Nine Elms retorts and Fig. 19 from Bow Common retorts. These also show the same periodic structure.

It has also been confirmed, both by the above combustion technique and also by direct observation of the charges *in situ*, that pieces of flat shale line up in the same direction as these bands, as was pointed out by Rhead in the Paper referred to above.

On the other hand, cokes from horizontal retorts (Fig. 20) show no such laminations, so it is probable that they are connected with the discontinuous nature of the extractor action.

The explanation given by Rhead, that the extractor allows the charge to descend over each successive portion of the major axis and proceeding outwards so that the charge moves downwards not as a whole, but in successive vertical sections, can hardly be the correct one; we have already seen that the coke envelope must move as a monolith. The more probable explanation appears to be that the pressure caused by the expansion of the plastic coal can be relieved by the coke envelope slipping away from the coal contained therein, *i.e.*, the coal core need not always follow on the enveloping coke to exactly the same distance that the coke has travelled, and so there is a slipping action at the plastic layer which pulls the pieces of shale into a vertical position.

The separate laminations do not appear to be sufficiently close together to correspond to each individual action of the extractor. Their occurrence will probably depend on the type of coal being carbonized, the throughput and, particularly, the shape of the retort. In this connexion it will be noticed that the bands are very much

FIG. 20

wider in the coke from the Nine Elms retorts than from the Bow Common retorts, suggesting that this slipping action does not take place so often in the former. This is quite likely since the Nine Elms retort has continuous taper on both major and minor axes and, as shown by the block density measurements, allows more room for lateral expansion of the charge.

General Deductions

When considering the evidence presented in this Paper, it must be remembered that, as in the previous experiment, the results refer to the carbonization of Durham coals with low rates of steaming, making gas with a calorific value of at least 500 B.Th.U. per cu.ft.

It is realized that the experimental findings may be open to interpretations other than those given by the Author. Very full data, however, have been given in the tables and photographs to enable the reader to formulate his own conclusions.

From the results given on retort wear, it can be said that whatever is the correct explanation of the facts noted, they indicate strongly, if not conclusively, that there should be some taper on the major axis in the upper part of the retort, say for the first 15 ft. down. The structure of the charge in the lower part of the retorts and the lower voidage in the Bow Common compared with the Nine Elms retorts confirm this deduction.

The fact that the coal core extends to at least 20 ft. down, and probably further, under the normal conditions of working, making 520 gas or higher, means that the minor axis taper should extend to at least this depth instead of ending at 15 ft. Even if the walls remained parallel, as when new, the carbonization of the core in this part of the retort would cause pressures likely to jam the charge. In actual practice, as the retort ages, the major axis walls tend to come together, particularly in the middle, so that the retort plan is of a slightly "waisted" shape, and in fact the minor axis dimension may *decrease* as one descends the retort. This would obviously cause jamming even with a completely carbonized charge. From all aspects, therefore, it is desirable that minor axis taper should extend to the whole length of the retort.

In the lower sections of the retorts there was particularly heavy wear in the corners, the minor axis increasing by as much as ¾ in. right at the ends. This increased wear may be partly due to the scouring effect of the hot gases, most of which probably ascend up the free spaces in the corners, and the longer the major axis of the retort the more gas per corner must ascend in unit time. There is also, however, the effect already noted, of coal slipping from the core into the normal free spaces at the ends of the charge and then, by carbonizing in a space of constant cross-section, causing excessive pressure on the corners. This appears extremely probable from the photographs of the 21 ft. levels in both retorts.

Anything that promotes even and continuous travel of the charge, such as continuous minor axis taper, will help to prevent the formation of internal void spaces and hence the chance of coal slipping through and causing the above effect. Then if this jamming can be prevented, this in itself will promote smoother travel. Some consideration should also be given to the design of the auxiliary coal box, in order to prevent the holding up of coal at the mouth of the retort. The ideal solution is for the coal box to be placed directly over the retort, as in some early designs. Otherwise the angle of slope of the back of the coal box and the depth of the ironwork where the rodding holes are placed should both be increased. The combined effect of these alterations should be to cause the coal to flow more directly and, therefore, easily into the retort. With these three modifications, the improvement in travel should be considerable, leading to improved H.E.V. and thermal yield.

DISCUSSION

The **President** (Mr. F. Dawson) said it was obvious that Dr. Weston had taken a great deal of trouble in the preparation of the Paper and it would be well worth taking home and studying at greater length. After the anatomical section of the report, he imagined that Dr. Weston would be qualifying as a doctor of medicine as he obviously possessed the skill which was required. He imagined it called for a great deal of skill, patience, and trouble to dissect a retort in that way.

Dr. **S. Pexton** (Gas Light and Coke Company) said it was a privilege and a pleasure to be asked to open the discussion on this excellent Paper, so ably presented by Dr. Weston, and he would confine his remarks to a few general observations of a background nature on this important subject. Continuous vertical retorts were essentially a British development dating back to the beginning of the present century and if he might use an analogy, their period of development coincided with that of our great ocean-going liners. No one could doubt the true worthiness either of continuous vertical retorts or of their counterpart on the seas. He had used this analogy because for a long time past, his Company had put each new carbonizing plant through its performance trials in order to get the fullest working information possible at the time when each unit was "launched" into practice. In addition, and when, as in these experiments at Bow Common, a plant had reached the end of its useful service after about 4,500 working days, the technique described had been applied in order to search for such possible details of improvement in the shape and taper of the retorts as could be tried out in future installations. They would all realize not only the magnitude of the task but also its importance.

Longer Life of Refractories

They were also receiving the expert co-operation of the British Refractories Research Association in trying by means of this type of experiment, to add something to the already long life of the refractories of continuous vertical retorts and Mr. A. T. Green sent his apologies for not being able to attend. Dr. Weston's investigations seemed to point to the desirability of providing taper on the major axis of the retorts at least in the top 15 ft. Continuous minor axis taper had already been provided on the new retorts recently built at Bow Common, but it would remain for some future installation to try out the recommendation of taper on major axis also.

Smoothness of travel of the charge affected every aspect of continuous vertical retort practice and while their thoughts were concentrated on studying the shape and taper of the retort to a particular class of coal, they must not forget that uniformity of coal quality in respect of both size and swelling index were factors of the greatest importance. The presence of voids in the charge at the non-off take end was probably associated with the coal "crusting" over at the angle of repose as determined by the curtain plate. The inflowing coal then formed a new and steeper angle of repose and a void. Experiments of the kind described by Dr. Weston were truly large scale experiments demanding great effort and skill and he looked forward to the time when they would be able to apply the same quenching technique of some of the earliest designs of vertical retort settings which were fortunately still operating, although they had of course been rebuilt several times. It had been a real pleasure to hear Dr. Weston's presentation of the Paper and to see Mr. Kelly's photographs on the screen.

Dr. **A. E. Haffner** (Gas Light and Coke Company) said Dr. Weston had kindly invited him to be present during the quenching of the Bow Common retorts and he would like to pay tribute to the skilful way in which the quenching was organized and the patient care with which the retorts and the charges were dismantled. The Nine Elms experiment disclosed interesting data which were presented in a somewhat over-simplified but provocative form. The Bow Common experiment, with more refined technique, went much further and much more than twice the information was now available from the two experiments. There was a lesson to be learnt by the practical gas-maker from the fact that a stoker smashed the bulb of the thermograph while augering. This was in spite of the fact that there was a notice "Do not auger." That seemed to be the best way of making sure that augering was done.

With regard to the movement of tallies, the entrance effect seemed to have obscured their information as speed indicators and it would seem wise, in future experiments, to inject the tally into a definite position, say, 4 ft. below the rodding hole. The difficulty of finding metal tallies which assumed the appearance of coke would be overcome by having a magnetic detector. The laminations revealed by the Rhead technique appeared to be connected with the periodicity of the extractor and it would be highly informative to carry out an etching of coke that had passed through the sector extractor of the Slough type.

After the Nine Elms experiment, an attempt was made to calculate the position of the coal core by using heat flow data. It would be interesting to know whether this had been done in this case and it would be wise to have in mind during the planning of these quenchings the study of the heat flow through the retort wall. With Durham run-of-mine coal, the shape and taper of the retort were highly critical. He agreed that there should be continuous minor axis taper at least to the base of the coal core. Continuous taper also implied that there should be no change in shape of cross section of the retort at different levels.

Although these quenchings had been carried out on old retorts, now that the technique had improved, there was justification for carrying them out on new specially built single units. The use of materials in short supply for such a purpose might horrify some of them, but the waste was not to be compared with that which might result from the building of large installations with novel features of retort taper and shape.

Retort Taper

Mr. W. J. Gaskell thanked the Association for the opportunity of addressing them. Unfortunately he had not in the circumstances had an opportunity of reading the Paper through and he felt it would be presumptuous to comment upon it without having done so. He would, however, say what a valuable piece of work it was and how pleased he had been to hear Dr. Pexton's proposal to repeat this. He felt that such experiments could not be repeated too often. It was, of course, a fundamental that with the thinness of the charge every step must be taken to ensure that, and these experiments had enlarged their knowledge very much as to what happened and would, he felt sure, help any future developments along that line.

He had been extremely interested in the point raised with regard to the taper of the retort and also the entry of the coal, and while, for the reason he had already stated, he did not think he ought, at that point, to enlarge upon that, he could assure Dr. Weston that they would take much notice of and give much thought to the points he had raised. There was a point about the vicinity of degradation. If he remembered correctly, in the previous Paper by Dr. Weston, the latter had not gone into that question of the formation of carbon being evidence of the formation of degradation and the cause for the voids. Mr. Gaskell added that he would be rather interested to know if that followed, and whether there was any evidence of degradation and whether Dr. Weston, if it were not asking too much, would give some idea of the extent of the degradation.

Dr. Weston had raised the question of the carbon plate and its influence on the formation of the void, and he was very much in agreement with Dr. Weston on that. There was very little doubt that the carbon plate had an appreciable effect on the travel; in other words, one might even have gone so far as to say there was a circle on the carbon plate which was correct for any coal and the carbon plates and the retorts in question might have been quite appropriate for the Yorkshire coal, but not for the Durham coal and therefore may have given rise to the voids.

Mr. **H. Bardgett** (Fuel Research Station) said one point in the Paper which struck him as remarkable was the fact that one came into the core of what appeared to be unconverted coal as far down as had been stated when testing by dialatomical tests. That great swelling of the coal was the original coal fed into the retort and if that was actually unconverted coal, as it certainly seemed to be, it did emphasize very forcibly what a tremendous value that very narrow plastic layer presented and if one could find some more means of modifying it in such a way as to get rid of that transfer the rate of heat transfer would be very much speeded up and the fruit of the retorts very much increased.

It seemed that those very valuable experiments ought to be

repeated whenever the opportunity occurred and in view of what had been said about the extractor, he felt it would be interesting to see a similar experiment carried out on new retort plant with the newer type of extractor. It would be instructive to see the tests and the coal structure that were produced by a continuously operated retort as compared with that produced in a retort which was standing for certain periods of the process.

The Paper, he was sure, would provide much information of very considerable value to the retort constructors and he was sure they would be very grateful for the opportunity of finding out by that particular technique what happened in a vertical retort in order that they could so modify their designs as to improve the coal and possibly to influence the extent of the cracking of the tars and gases in their travel from the coal to the surface.

Differences in Technique

Mr. **S. L. Wright** (Deal) said he was in the position of controlling two sets of continuous vertical retorts, one being of that pattern which was erected in 1927 with downward heating, and a neighbouring bench which had been erected in 1931, with upward heating. In 1942 the downward heating setting had been taken down and the stokers changed over to the upward heating setting and in the course of the war years he had occasion to train a new series of top men, the previous stokers going on to the ground floor, so that in 1945, when they relaid the downward heating setting they were faced, without realizing it, with a new set of top men and they had had a very great deal of trouble for some eight weeks before they realized that the whole trouble with operating the retorts and having hanging charges and stopped pipes all on Yorkshire coal, was with the stokers themselves who had been training on an upwardly heated setting and had not realized the different technique which was necessary with a downwardly heated setting. He mentioned that, because he thought it showed how useful this information was and how desirable the same kind of experiment should be carried out with other sorts of retort, downwardly heated settings, because obviously from the very great differences in each, that ought to be done.

He was particularly pleased that that experiment had been carried out because the setting with regard to downwardly heated settings was going to be rebuilt this winter and he hoped the company responsible would study the Paper and perhaps take advantage of some of the suggestions made with regard to the new retorts that were to be erected at his works.

Mr. **E. G. Stewart** (Gas Light and Coke Company) said the Paper involved the sort of subject about which one could talk all day long and it had brought to light so many things that were not in the thickest textbooks that they had learned very much from it indeed. He felt that one of the most important things brought out from the practical point of view was the extreme importance of the charge. He thought that it was brought out very clearly that what was going to happen to the retort if it were going to run freely depended on what happened to the charge in the first four or five feet of the retort. If the chance were missed there, one had missed the boat altogether. He thought that that was one very important thing which stuck out a mile in that experiment.

The other point was that it was, of course, clear that there ought to be a taper in each direction on the retorts and he thought most of the retort makers had realized that. On the other hand, to make a vertical retort, especially a large one, taper in both directions meant that every curve and course of bricks was different and, of course, the retort manufacturers had to live and would have to put the price up accordingly. But if we went back to the very early retorts, he could think of one stage earlier at Kensal Green where there had been a tube which did expand in all directions so that it was possible merely to alter the floor pipes.

He had been rather hoping Dr. Weston would say something about the degradation of gas because it was very clear, particularly with these large vertical retorts, that the gas which came off was a mixture of under-cracked gas and over-cracked gas. That, he thought, was very clear from the analysis. He thought otherwise a real discussion was needed for that lecture on carbonization.

The Author's Reply

Dr. **Weston**, replying to the discussion, said he had always been interested in Mr. Dyde's talks and would like to have an opportunity of discussing the matter with him more fully. The use, also, of a special new retort would be a very nice toy to play with, but whether they were likely to get that for some long time was a matter for conjecture, and he was afraid it did not seem likely. There was formation of carbon in the void, certainly, as they had found in all these cases where there was a large void there had been a considerable deposition of matter in those voids, and also with the whole instrument, but it was very different in that type of retort at Nine Elms where apparently the gas came up the whole periphery of the funnel. In the other cases it largely came up through the ends. On the photograph shown, the main coke charge only touched the retort at a few points. The rest of the charge was really black carbon, so some gas obviously came up there, but the majority came up the ends as well and one would probably get a very different state of cracking in those end retorts from the other type, and those retorts obviously did give over-cracking, but as regards figures, he was afraid he could not give them. The increase in the rate of heat transfer had been shown in retorts where they had carbonized large amounts where the throughput could be made very much greater. If anyone could do it with ordinary Durham coal, no doubt it would be very useful. He thought they had stressed that same thing in their first Paper. He realized that it did seem to be an all-important point in that type of retort, although it would appear that it did not seem to be working at all judging from what had been said. He desired to express thanks to the retort makers for the great interest and trouble they had taken in carrying out these particular experiments.

The Smaller Works

Mr. **L. P. Ingram** (Taunton), proposing a vote of thanks to Dr. Weston, said that in the West Country they were such a scattered community with few, if any, works large enough to engage a super-technician of Dr. Weston's class that it had been a technical and an intellectual treat to listen to his Paper and they looked forward with great interest to the third instalment of the hair-raising serial when he had quenched Mr. Dyde's retort.

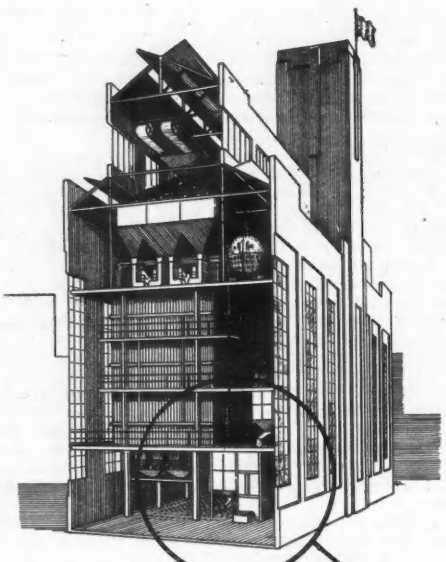
They had been so snowed under in recent years with forms, licences, permits, and quotas, that he was afraid they were in danger of getting their technical appreciation somewhat atrophied and he was afraid it was going to take the lesser men some time to digest the fare which Dr. Weston had that day landed out with such a lavish hand. That, he was afraid, was a roundabout way of saying they would have to take it home and get out a textbook or two and call upon their technical staff for help. But for all that Dr. Weston had said, might he congratulate him upon the excellent Paper which, he thought they would all agree, was a most valuable contribution to the knowledge of the mechanism of carbonization.

Mr. **J. H. Dyde**, seconding, said for years there had been much speculation about the mechanism of carbonization—quite naturally—as that was the very pulse of their production machine; but strangely enough little had been said to help the plant designers, and particularly those employed on the continuous carbonization system, by ascertaining what was actually going on within the retort. The new line of investigation which had been opened by Dr. Haffner and Dr. Weston in their Paper in 1943 was novel in its approach and they had seen another interesting sequel to it that afternoon.

The question of retort taper influencing the free space, and in consequence the amount of curve formation and also the actual physical structure of the coke were, of course, paramount in that investigation. It would seem that in large, continuous retorts employing a constant description of coal, there had to be an optimum size, and that should be so for the retorts to have the best conditions.

He was pleased to note that mention had been made by Dr. Pexton of the influence of the free increase of coal at the top of the retort. He thought that was most important, and so was the nature of the coke extractor. In the original Paper, Drs. Haffner and Weston had made the statement that the smooth coal travel had to be dependent upon the retaining of the continuous charge structure. That had been one of the reasons why they had put up an installation of the new type of coke discharger last year on a million a day unit at Slough. That did, they felt, give a very definite movement in cyclic fashion every 40 minutes to the coal and they had felt it would, by that very definite movement, also eliminate voids. It had been suggested that an early demise might be given to those particular units. He was willing to sacrifice most things in the interests of science, but it would be most difficult to cut off this tender plant in its so early life. However, he could make one proposition—that if the Gas Light and Coke Company, to whom they were now physically and well united, were prepared to afford them the necessary supplies at a price not exceeding that at which they could manufacture it, and also if the Gas Research Board were prepared to come down to earth, as it were, from their higher plane, and contribute towards the resetting of, say, two of those units, he would be happy in the largest interests of science to oblige. They would certainly be happy to let Dr. Haffner have a little coke as they had actually accumulated a stock within the last few weeks. They were indebted to Dr. Weston for his further enlightenment by means of his interesting and fundamental study of carbonization processes and he was sure that not only they of the Association, but the plant designers and others were interested too.

Dr. **Weston** said he had been particularly gratified by the way in which the members had received his Paper and especially the remarks of Mr. Dyde he took not only for himself but for his colleagues, without whose help the work could not have been done. He was sorry the members had been at the disadvantage of not having copies of the Paper before them. As Dr. Pexton had said, the results were open to several determinations and for those conclusions which he had drawn himself he had given full details of the analytical results, curves, and reports for when the members had time to study them, and if they were interested in vertical retorts, they might draw conclusions which might possibly be different from his.



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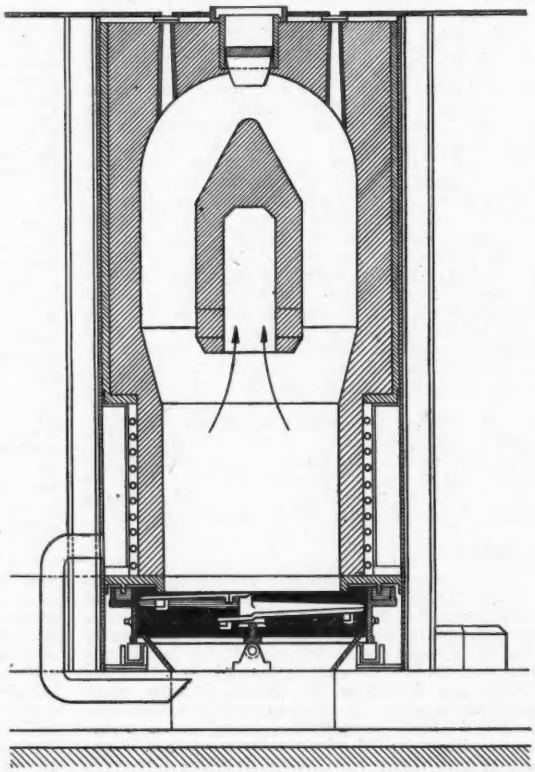
IN THE
GLOVER-WEST SYSTEM
OF
CONTINUOUS CARBONIZATION
IN
VERTICAL RETORTS

PROGRESS



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Gas Undertakings' Results

Bideford Gas and Coke Company.—Dividends of 13½% on the Original shares and 10½% on the Additional shares were declared at the annual meeting on May 29. The balance carried from revenue to profit and loss account was £6,489, and the carry-forward was £2,775 against £2,785 brought in.

Auckland Gas Company (New Zealand).—Of a total revenue of £551,608 for 1946, £56,096 was carried to profit and loss account representing the profit for the year, including Government subsidy of £17,500, and after deducting working expenses, rates and land tax, depreciation, and other charges. A dividend of 2½% has been declared, leaving £13,308 to be carried forward, compared with £14,493 brought in.

Plymouth and Stonehouse Gas Light and Coke Company.—Net profit for the year ended Mar. 31 was £27,115 against £28,378 for the previous year. No appropriation was made to renewal fund, against £9,000 in the previous year; £48,846 was taken from renewal fund against £2,132, and £8,652 was taken from deferred repairs fund, against nil. The Directors recommend final dividends of 2⅛% actual on Ordinary stock, making 5⅝% for the year, 9s. per share on the Additional shares, making 16s. 6d., and 8s. 6d. per share on the New shares (Act 1879), making 15s. 6d. for the year, leaving a carry-forward, subject to final dividend, of £55,373, against £56,166 brought in.

Holyhead and North Wales Gas and Water Corporation.—The 51st annual report records that gas sold during the year ended Mar. 31 showed an increase of 19,425,400 cu.ft. over the previous year. The net profit carried to appropriation account was £7,600, against £10,476 for the previous year. Income from the sale of gas was £62,538 compared with £55,789, while manufacturing costs were £59,568 compared with £38,273. A dividend of 7½% leaves £10,254 to be carried forward against £9,903 brought in. Mr. C. Holt, of Todmorden, has been elected to the Board to fill the vacancy caused by the death of Mr. Owen R. Jones, General Manager, whose appointment to a seat on the Board was confirmed at last year's annual meeting.

Belfast Gas Department.—The report of Mr. J. L. Hyslop, Engineer and Manager, states that notwithstanding increased costs, there is a reasonable prospect of the undertaking coming through the current year without an increase in the price of gas. Demand for gas has been heavier than ever, the total made being 5,266 million cu.ft., or an increase of 101 million cu.ft. over the former maximum—26% higher than the 1939-40 output. The Christmas Eve (1946) output was the heaviest ever recorded—20,189,000 cu.ft. being supplied. There was an increase of 12,471 tons of coal carbonized—the total being 224,783 tons, a new high level, coal costing £655,335, an increase of £79,208—4s. per ton higher than a year ago. Coal reserves were low and deliveries short of requirements for many months. Reserves were at a dangerously low level and unless deliveries were obtained during the next few weeks, on a scale much higher than at present, the outlook for the winter would be serious indeed. The report showed a gross profit of £160,275 on the year's trading, and a net profit of £61,958, or slightly higher than last year. The wages bill had increased by £53,000; the additional cost of operating the 44-hour week was estimated at £28,000. The undertaking had had to make a new contribution of £14,000 towards the cost of the Town Clerk's, City Treasurer's and Town Solicitor's Departments.

Trade Notes

Meter Catalogue

George Wilson Gas Meters, Ltd., have published what they describe as a post-war catalogue, but which is in fact an extremely useful text book on the construction, working principles, testing, use, repair, and maintenance of gas measuring devices and their accessories. The Managing Director in a brief foreword hopes that it will prove of real interest and assistance to those responsible for the well-being of the Gas Industry, and from a perusal of its 84 pages we have no doubt that his hope will be realized. After describing the many different types of meters in use—ordinary, prepayment, cost, dry test, peak load, leakage, therm, cookery demonstration, hotel, and others—together with valves, locks, and gauges, the catalogue quotes current prices, allowances, and repair charges, and includes extracts from the Board of Trade test for gas meters. Lists of parts and details of prepayment mechanisms and two-coin optional attachments are followed by a description of the Company's latest achievement, the prepayment cash balancing meter. Several pages of tables on meter settings, properties of metals and liquids, gas flow, sheet metal weights, meter union dimensions, and other data make it an ever-ready book of reference in the meter department.

Distant Pressure Recorder

The Evershed-Widlake Distant Pressure Indicator and Recorder recently placed on the market by Evershed & Vignoles, Ltd., enables the pressure attendant on a gas-works to follow at a glance all changes in pressure throughout the distribution network. The equipment, which comprises a transmitter connected by two pilot lines to one or more distant receivers, has been developed jointly by Mr. H. C. Widlake and Evershed & Vignoles, Ltd., who have had many years' experience in the production of apparatus for distant indication and control. An advance leaflet (No. 218), giving brief details of the new system, has just been published.

Gas Stocks and Shares

The past week opened with quiet and dull conditions in the stock market, and most of the changes in industrial shares were in a downward direction. With the opening of a new account, however, industrials became more cheerful, and a generally firm tone developed towards the end of the week. Renewed selling of British funds resulted in a lower price level, though they became steadier on Thursday. On the week the Government security index dropped from 118.11 to 117.87, a rise of 0.25 points on one day being followed by a fall of 0.19 on the next. A feature of the gas stock market was the demand for Imperial Continental shares. Dealings throughout the week were somewhat fewer than in the previous week. Principal interest was taken in British Gas Light, Commercial, Croydon, Gas Light and Coke, and South Metropolitan. In our stock market report of June 11 the quotation for Wandsworth Cons. was erroneously given as 118-123; the figure should have been 108-113. Rises and falls during the week were as follows:

OFFICIAL LIST

Assoc. Gas & Water, deferred ...	20/—	22/—	+	6d.
British Gas Light 5½ p.c. 'B' cum. pref. (xd. June 18)	109	—114	—	1
Colombo Ltd. ord. (xd. June 18)	39/6	— 41/6	—	1s.
Colonial Gas Assn. Ltd., ord. ...	17/—	— 19/—	—	1s.
Commercial ord.	88	— 91	+	2
Croydon, 4 p.c. perp. deb. (xd. June 18)	99	—104	—	1
Do. 5 p.c. perp. deb. (xd. June 18)	119	—124	—	1
Derby 4 p.c. red. deb. (xd. June 18)	99	—104	—	1
East Surrey 5 p.c. irred. deb. (x.d. June 18)	119	—124	—	1
Holyhead & North Wales, ord. (x.d. June 18)	21/6	— 23/6	—	6d.
Imperial Continental cap. ...	120	—125	—	3
Newport (Mon.) 5p.c. perp. deb. (x.d. June 18)	119	—124	—	1
Plymouth & Stone, ord. (x.d. June 18)	103	—108	—	2
Wandsworth 5 p.c. irred. deb. (xd. June 18)	119	—124	—	1
Do 4 p.c. irred. deb. (x.d. June 18)	99	—104	—	1

Gas Products Prices

The London Market

June 23.

The prices of Coal Tar products are unchanged.

The Provinces

June 23.

Average prices for gas-works products: Pitch, 75s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gall.; pure, 3s. 2½d. Prices for carbolic acid 60's anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.) and strained anthracene oil are controlled by Government Orders. Prices for road tar are increased by one penny per gall. by S. R. & O. 1947, 177, under which Order there are also increases in the prices of naphthalene.

Scotland

June 21.

Throughput is well maintained with prices firm.

*Refined Tar.** Yield to the distiller is 6d. per gall. ex works, naked. *Creosote Oil.* Timber preserving quality* 5½d. to 6½d. per gall.; Hydrogenation Oil* 5⅞d. per gall.; Low Gravity or Virgin Oil† 7½d. to 7½d. per gall.; Benzol Absorbing Oil 6½d. to 8d. per gall. *Refined Cresylic Acid* is 3s. 6d. to 4s. 6d. per gall. ex works, naked, according to quality. *Crude Naphtha*† 7d. to 8d. per gall. *Solvent Naphtha.** Basic maximum prices delivered in bulk 90/160 grade, 2s. 10d. per gall., and 90/190 Heavy Naphtha, unrectified, 2s. 0½d. per gall.; Rectified, 2s. 4d. per gall. *Pyridine.*† 90/160 grade 15s. per gall., and 90/140 grade 17s. per gall.

* Price controlled. † Uncontrolled

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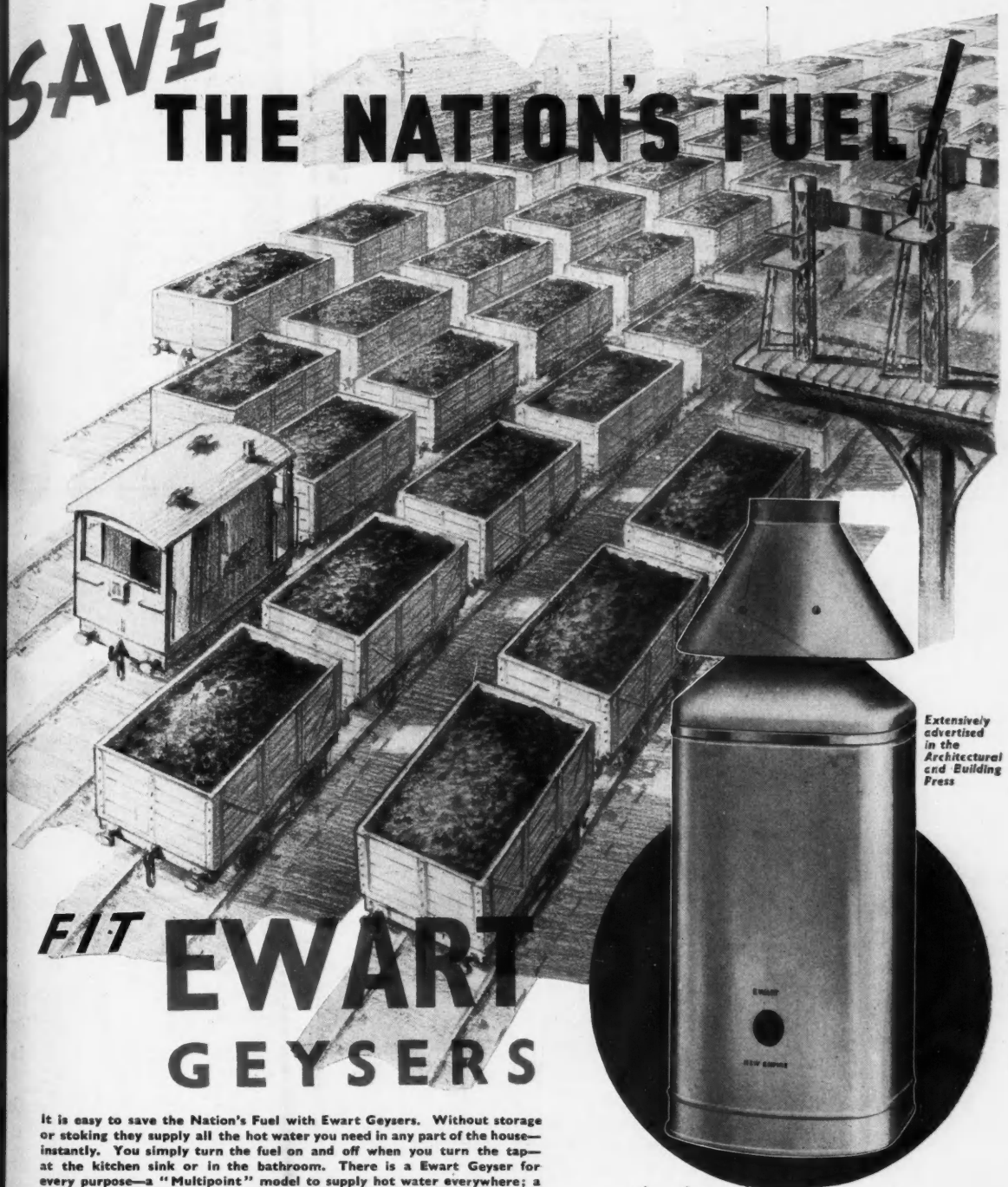

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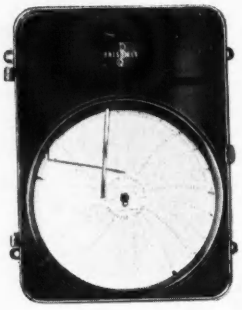

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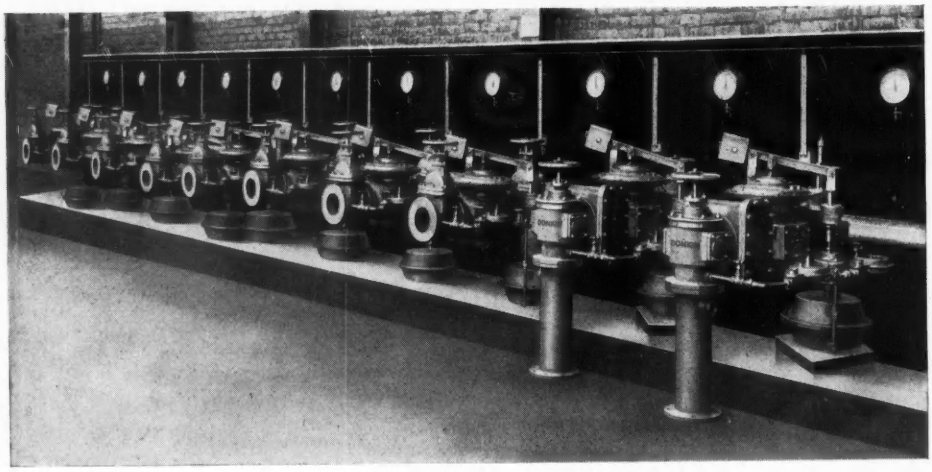

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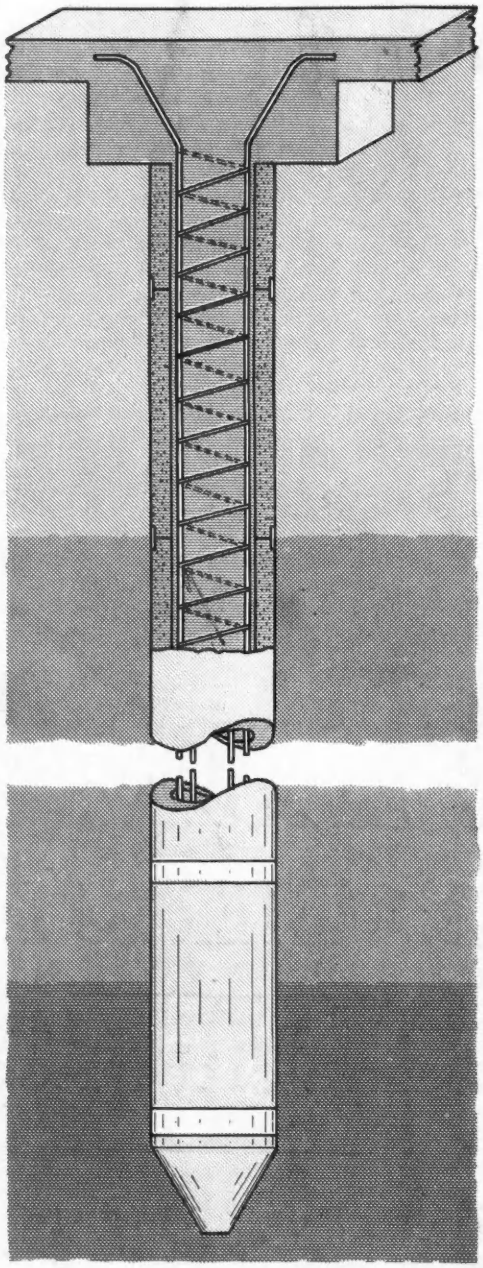

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